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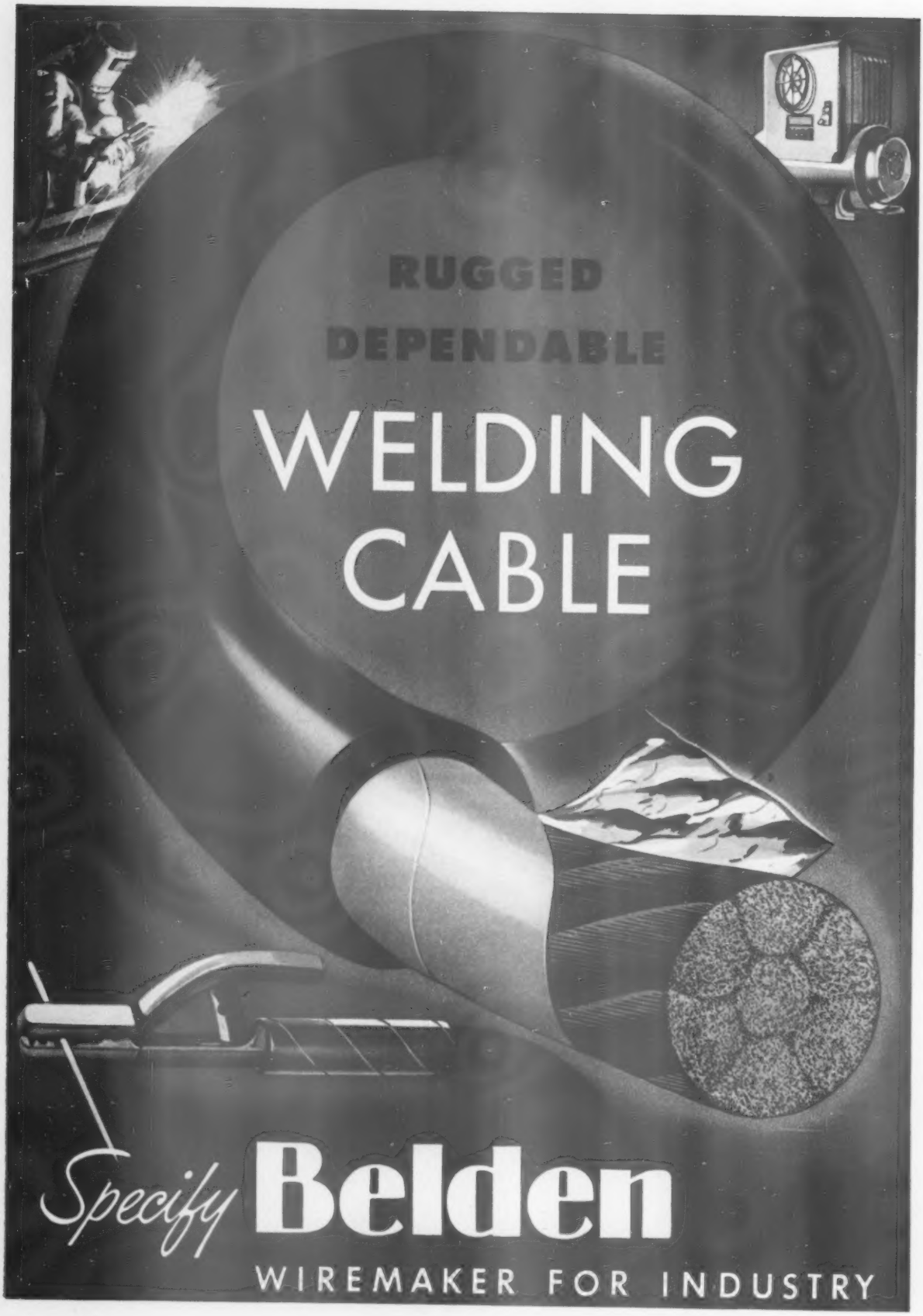
THE WELDING ENGINEER

SEPTEMBER, 1953

Bascule Gates Welded for Horseshoe Dam . . . . *page 39*

Thermit Welding Renews Steel Mill Rolls . . . . *page 44*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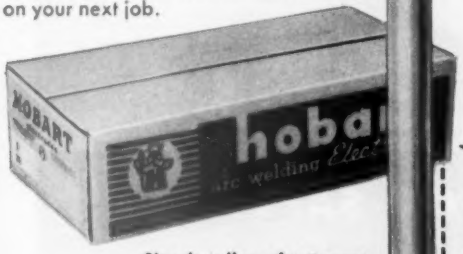

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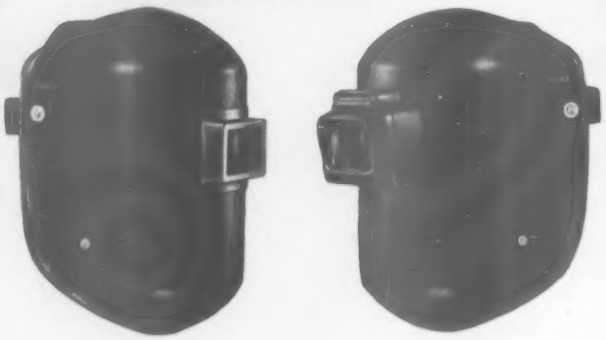

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SEPTEMBER, 1953

***Cover:** Welded steel radial gates increase the height of the Horseshoe Dam (Ariz.) spillway by 26 ft. See page 39.*

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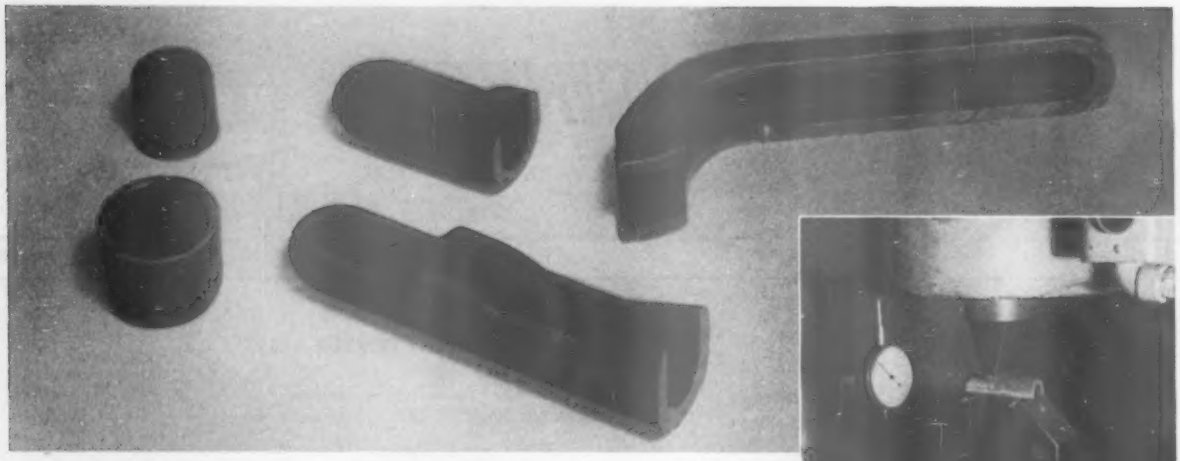


Newly Developed Glass Fiber Insulation gives longer trouble-free life to Jackson Holders

High heat, and, in many cases, high impact, make jaw insulators the most vulnerable parts of any arc welding electrode holder.

Jackson Products, pioneer manufacturer of insulated electrode holders, has time and again brought out worthwhile improvements in both the design and composition of holder insulators.

This time, here's the news: Not only the jaw insulators, but all the insulators on the entire line of Jackson Insulated Holders, are now made of an entirely new thermosetting material, all glass fiber reinforced, that exceeds in durability, by a wide margin, any material so far used for this purpose.

As a constant check on their quality, we have these insulators periodically tested by independent laboratories . . . not just sample bars of the same material, but the actual jaw insulators, completely fabricated, countersunk screw holes and all.

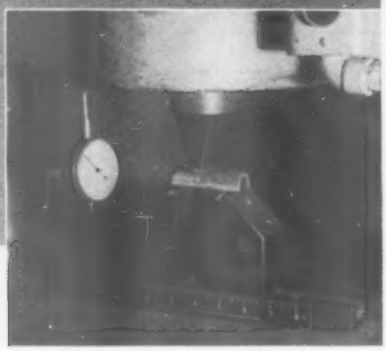
Compared to the jaw insulators previously used, these new pieces show greater strength under compression, more than twice the strength under flexure, and more than eight times the strength under impact. Electric furnace tests at temperatures of 500, 1,000 and 2,000° F. prove that the new Jackson Insulators retain their shape and their full insulative characteristics at temperatures well above those normally encountered.

More good news: These superior insulators are furnished on the holders at no extra cost, and as replacement parts at no increase in price. They still cost less than other makes.

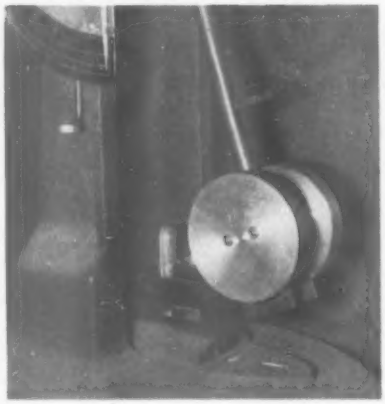
New Holder AW-C with the new insulation, shown in detail above.

Sold World Wide . . . through Distributors and Dealers.

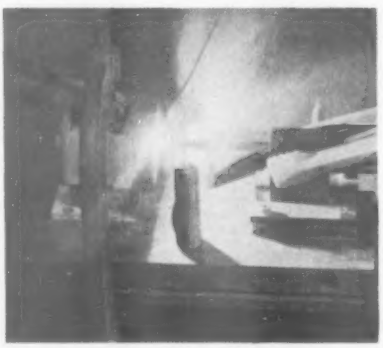
JACKSON
PRODUCTS
WARREN · MICHIGAN



FLEXURE TEST shows insulator, supported two inches apart, with load applied downward at the center.



IMPACT TEST shows insulator, held vertical in vise, about to be hit by pendulum at 16 foot-pounds.



The CARBON ARC TEST is part of continuous quality control at Jackson's Plastics Department. The 1,300° F. heat applied by this method, at a distance of two inches from the test pieces, is comparable to the temperature normally radiated by two-inch electrode stubs.

GOLDEN "SAMMY" award is given to Lloyd Deris, welding equipment sales, Mullenbach Electrical Products Co.

ERNIE DANIELS (left) and Karl Heinemann (right) mark 25 years service with Victor president Lou Stettner

NEWS

NWSA Meetings Set For Fall and Winter

HERE are the dates and locations for fall and winter meetings of the National Welding Supply Association: eastern zone, Sept. 17-18, Hotel Statler, New York City; central zone, Sept. 21-22, Park Shelton Hotel, Detroit, Mich.; west central zone, Nov. 12-13, Hotel Continental, Kansas City, Mo.; southeastern zone, Dec. 7-8, Dinkler-Tutwiler Hotel, Birmingham, Alabama; southwestern zone, Dec. 10-11, Baker Hotel, Dallas, Tex.

The tenth annual convention will be held at the Hotel Fairmont in San Francisco on Feb. 15-17, 1954.

* * *

Welding Salesman Wins Famous "Sammy" Award

left photo

LLOYD DERIS, welding equipment salesman for Mullenbach Electrical Products Co., Los Angeles, has won the coveted "Sammy" award, presented each year to the 10 best salesmen in Southern California. The honor is sponsored by the Sales Executive Club of Los Angeles. This is the second straight year that a Mullenbach salesman has won the award.

Candidates for the gold figure are nominated by company sales managers and graded as to initiative, creative selling ability, knowledge of product and customers, ingenuity, appearance, ability to organize work and volume of business sold. Some 64 salesmen were nominated for the award this year.

* * *

Welded Blast Deflectors Stand Up Well in Combat

ARMY Ordnance reports that its artillery research and development program has been unable to make satisfactory muzzle brakes out of cast steel. The brakes or blast deflectors are used on high-velocity tank guns.

However, muzzle brakes made of 95,000 psi (annealed) steel and manually arc welded do stand up in combat.

Many of our tanks were used as field artillery pieces in Korea for prolonged barrages. Some tank crews, after repeated firings, saw the muzzle brakes take off after the shell. Because of the lack of room for recoil inside a tank, it is more important to have a stronger, rugged muzzle on the tank gun than on a field artillery piece, according to Ordnance.

* * *

Nickel Powder Shortage Hits Low-Hydrogen Rods

NICKEL steel remains short, especially in the high-nickel alloys and in powder form. Nickel powder is used in low-hydrogen electrode coatings. The best reason that can be given for the continued shortage is the 10% increase in stockpile requirements.

Victor Men Celebrate 25 Years with Company

right photo

ERNEST A. Daniels, vice-president in charge of sales, and Karl F. Heinemann, factory superintendent of Victor Equipment Co. recently were honored for 25 years service with the firm.

At a dinner party attended by 60 employees, L. W. Stettner, president, presented Mr. Daniels and Mr. Heinemann each with an expensive imported watch appropriately engraved to mark the occasion.

* * *

AEC Welding Experts Formed Into Committee

THE Atomic Energy Commission has organized a welding committee made up of representatives from its prime contractors. Purpose is to speed up and correlate a free exchange of classified welding information. In addition, one subcommittee has been named to study code standards and procedures while another is in charge of the study of service experience of welded structures.

* * *

British Welding Exhibit at London, Sept. 3-17

CONSIDERABLE American interest is expected at the Engineering, Marine and Welding Exhibition and the Chemical Plant Exhibition, Sept. 3 to 17 at London's Olympia Hall. At the last exhibition in 1951, more than 500 manufacturers displayed their products.

Both arc and resistance welding equipment will be on display. Many other types of marine and chemical equipment will be shown also.

NEWS

from page 5

Courtesy Remington Rand Inc.

PROJECTION welding of machined parts to flat stock does away with former tasks of countersinking, brazing

Courtesy Arcair Co.

STRIPPING 501 double fillet welds on a steel rack was no problem with a handy air and arc cutting torch

Remington Rand Likes Ring Projection Welding

FOR quality production of assemblies for business machines, Remington Rand has turned to ring projection welding. This process is specially applicable to assemblies of screw machine parts, according to F. A. Shultz.

The projection is turned on the screw machine part (right above) by means of a form tool. The part is then welded to either a stamping, a flat or a formed part.

Formerly the flat piece involved had to be countersunk, the hub had to go through a spinning or brazing process. The balling and reaming operations common to the spinning process are completely eliminated.

In preparing parts for ring projection welding, it is necessary to vary the height of the ring, depending on the thickness of the section to be welded to the hub.

Costs have been materially reduced since ring projection welding has been adopted at the Remington Rand factory, and the quality assemblies produced are almost impossible to break apart.

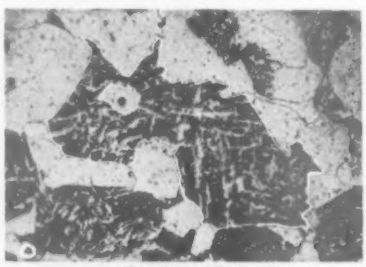
* * *

NWSA Publishes Standards for Welding Catalogs

COPIES of the official standards for catalog pages for welding supply houses are available from the National Welding Supply Association, 1900 Arch St., Philadelphia 3. Also covering counter catalogs, the standards were unanimously adopted by delegates at the recent national convention of NWSA at Cincinnati.

Robert C. Fernley, secretary-treasurer of NWSA, points out that these specifications include not only dimensions for standard catalog pages but also recommendations covering punching, paper stock, illustrations and identification and colors for price sheets.

* * *



Courtesy Watervliet Arsenal

Small Dog Found in Microphoto

A new microstructure discovered by Army Ordnance at Watervliet Arsenal has been nicknamed "Dogtite". The idea came from the above microphotograph which shows a dog in a er—sitting position. The new structure could be a clue to the cause of some weld failures. Ordnance is checking.

Though the new name may not make the metallurgical handbooks it would look interesting between austenite and martensite. Once restricted information, it was declassified when it was determined what the dog was doing.

Arc Cutting Saves 83% Working Time

Faced with the task of changing 167 mild steel cross members on each of three trash racks for McNary Dam in Washington state, Seidelhuber Iron & Bronze Works of Seattle had a real problem. Stripping the double fillet welds on the members in the first rack took 12 days with a chipper. Some 1,500 double fillets about 4½-in. long were cut out.

Seeking an easier way, the company purchased an electric arc cutting torch that utilizes compressed air to blow the melted metal away from the cut. Stripping time was cut to only two days on the second rack, according to Lawrence Reed, leadman.

Costs sustained included special carbon electrodes for the torch, which mounted to $4 per trash rack and operation of an air compressor and a 375 amp welding machine. Additional time and money was saved because the arc cutting job left much cleaner edges and less refinishing was necessary for rewelding.

* * *

Worthington To Expand Plainfield Works

MORE than $1,000,000 will be spent in the next nine months on a 33% expansion in the Plainfield Works of Worthington Corp. Products made at Plainfield include welding positioners, construction equipment and industrial mixers.

(More News on page 82)

no matter how much you spend you cannot buy finer regulators than National

AND—here is a listing of the exclusive advantages they offer you:

1. Manufactured by an organization which has been in the welding and welding equipment business for over 40 years — whose original owners and operators own and operate the company today.

2. All major parts are automatically machined from uniform bar stock which assures complete concentricity and, thereby, absolute uniformity. Nothing is rounder than a round bar — and nothing offers greater production uniformity and strength.

3. A fully sealed — nylon bearing — tension screw assembly for effortless, long lasting — silken smooth operation.

4. Self-reseating relief valves which are tamper proof, reliable and sturdy.

5. A patented feature permitting instant change from hand set to a pre-set.

6. Both high and low pressure reduction stages are pressure adjustable.

7. The nylon button takes end-friction out of the tension screw.

8. An efficient inlet filter, with renewable cartridge, is easily replaceable without total disassembly of parts or removal from regulator body.

9. A seat mechanism and seat material which gives longer and more pressure accurate regulator life — which keeps the regulator on the job rather than in the repair shop.

10. Metal diaphragms which are neither too large nor too little and which have been designed for long life and freedom from trouble.

11. Short, properly designed and made tension springs which neither buckle nor bind in service.

528

Made by National SINCE 1910 WELDING EQUIPMENT CO., San Francisco 5, California

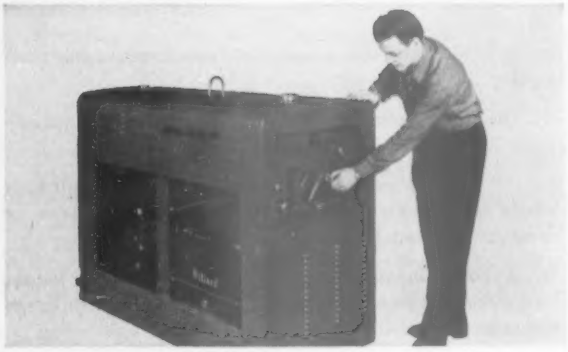
Welding Arcs

G-E MG WELDERS—half the size of other d-c welders of this type—offer a steady-arc interactor, single-dial dual control, easy inspection, wide current range, and high efficiency, for high production, operator satisfaction, low operating costs.

G-E AC WELDERS—best for 3 out of 4 jobs because of no arc blow—feature instant arc striking, steady capacitor-stabilized arc, exact current setting on the easy-to-read scale, high power factor for low-cost operation, and long-life silicone insulation.

FOR AC OR DC

Top performance, low over-all cost make G-E welders your best buy



G-E ENGINE-DRIVEN WELDERS—5 rugged types for every outdoor job—are powered by leading air- and liquid-cooled gasoline engines and diesels. Sturdily built to stand up in outdoor service, these units provide excellent welding performance.

Whatever the requirements of your welding job—whether it's AC or DC, indoors or outdoors—there's a General Electric welder available to give you unsurpassed performance. The features and operating benefits listed on this page can mean real savings for you during the long life of your G-E equipment.

You get more than just quality equipment when you buy G.E. Prompt shipment, application help, and complete service facilities provided by your local G-E Welding Distributor mean extra dollar savings for you.

For complete information on G-E welders and how they can help you do a better job at lower cost, contact your nearest G-E Welding Distributor today. He's listed here and in the classified section of your phone book under "Welding Equipment". General Electric Company, Schenectady 5, New York. 710-5

You can put your confidence in—

GENERAL ELECTRIC

News

Information on equipment, electrodes and accessories from G.E., pioneer in arc welding

New G-E electrode nomenclature will simplify selection, stocking, training

To simplify electrode selection, stocking, and training, which have been complicated by the large variety of electrodes manufactured today, General Electric has put into effect a new mild-steel and low-alloy electrode nomenclature system. This new system, closely tied to familiar AWS classifications, can be explained by a simple example:

The G-E electrode formerly known as W-28 is an AWS Class E-6012 electrode. Under the new G-E system, this electrode will be known as W-612A, formed by adding "W" to the basic 6012 and, for simplicity, dropping the "0". The "A" is used to differentiate between this electrode and two other Class E-6012 electrodes (formerly W-29 and W-20F) which will now be termed W-612B and W-612C. All other G-E mild-steel and low-alloy electrodes will be designated in a like manner.

During changeover to the new system, G-E electrode packages will carry both old and new numbers. Nomenclature of G-E stainless-steel and hard-surfacing electrodes will not be altered.

To familiarize yourself with the new G-E electrode nomenclature, ask your G-E Welding Distributor for a copy of GED-1634A.

Copyright 1953, G.E. Company

Joe Magee says . . .

New W-610A electrodes reported 8 ways better

User reports on General Electric's new W-610A electrode list 8 performance benefits of this outstanding Class E-6010 rod.

They say W-610A . . .

- is easier, faster to use
- is free of "wandering arc"
- eliminates pinholing problems
- produces lower-porosity welds
- stops "fingernailing"
- has a stable coating
- prevents excessive spatter
- makes slag removal easy

Find out for yourself

If you haven't discovered these benefits for yourself, contact your General Electric Welding Distributor today. He'll give you a free sample of G-E Type W-610A—the electrode that's fast becoming the quality standard for the welding industry.

FREE

Stainless-steel Guide

If you weld stainless steel, you'll want this new G-E Bulletin "Welding and Metallurgical Aspects of Stainless Steels". Written for both the novice and veteran weldor, this easy-to-read pamphlet is full of practical data to help you select electrodes, produce better welds, and avoid common problems in stainless-steel work. Ask your G-E Welding Distributor for Bulletin GET-1955.

Here's the name of your G-E Welding Distributor—

Alabama: Birmingham—Alabama Oxygen, Young & Vann Supply; Mobile—Turner Supply

Arizona: Phoenix—Consolidated Welding Supply

California: Fresno, Los Angeles, Oakland, Sacramento, San Diego, San Francisco, Ventura—Victor Equipment

Colorado: Boulder, Colorado Springs, Denver, Durango, Ft. Collins, Ft. Morgan, Greeley, LaJunta, Longmont, Pueblo—Hendrie & Bolthoff

Florida: Hollywood, Miami—Florida Gas & Chemical

Georgia: Atlanta, Macon—Welding Supply & Service; Augusta—Marks Oxygen; Columbus—Williams Welding Supplies

Idaho: Boise—Olson Manufacturing

Illinois: Chicago, Moline, Morton—Machinery & Welder

Indiana: Evansville—Drill Master Supply; Ft. Wayne, Indianapolis—Sutton-Garten; South Bend—Perry Welding Sales & Service

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Kansas: Coffeyville—Thompson Bros. Supply & Welding Equip.; Hutchinson—Kopper Supply

Kentucky: Louisville—Reliable Welding; Paducah—Henry A. Petter Supply

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Massachusetts: Boston—New England G-E Welding Sales Division

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Minnesota: Duluth—W.P.&R.S. Mars; St. Paul—Production Materials

Mississippi: Jackson—Jackson Welding & Supply

Missouri: Kansas City—Hohenschild Welders Supply; St. Louis—Machinery & Welder

Montana: Billings—Valley Welders Supply; Butte, Great Falls—Montana Hardware

Nebraska: Lincoln—Lincoln Welding & Supply; Omaha—Baum Iron

New Jersey: Kenilworth—Welding Sales

New Mexico: Albuquerque—Industrial Supply Co., Hobbs—Western Oxygen; Las Cruces, Silver City—Car Parts Depot, Inc.

New York: Buffalo—Welding Equipment Sales; Syracuse—Welding Engineering & Equip.

North Carolina: Charlotte—Dixie Gases; Gastonia—Gastonia Motor Parts

North Dakota: Bismarck, Fargo—Acme Welding Supply; Fargo—Dakota Electric Supply

Ohio: Akron, Cincinnati, Cleveland, Columbus, Dayton, Mansfield—Burdett Oxygen; Toledo—Odland Iron Works

Oklahoma: Tulsa—G-E Welding Sales Division

Oregon: Eugene, Portland—J. E. Haseltine; Medford, Portland—Industrial Air Products

Pennsylvania: Philadelphia, Pittsburgh—Arcway Equipment

South Carolina: Columbia, Greenville—Welding Gas Products

South Dakota: Deadwood—Hendrie & Bolthoff

Tennessee: Chattanooga, Knoxville, Nashville—Welding Gas Products; Memphis—Delta Oxygen

Texas: Abilene—M&M Welding Supply; Alice, Corpus Christi—Crane Welding Supply; Alpine, El Paso, Marfa, Pecos—Car Parts Depot; Amarillo—Tex-Air Gas; Brownsville, Harlingen—Acetylene Oxygen; Dallas—Hill Equipment & Supply; Hereford—Tex-Air Gas; Houston—G-E Welding Sales Division; Lubbock—Welders Supply of Lubbock; Midland—West Texas Welders Supply; Odessa, Pecos—Western Oxygen; Plainview—Plains Welding Supply; San Angelo—Southwestern Welding Supply; Snyder—Western Welding Supply; Texarkana—Hughes Oxygen; Wichita Falls—Nortex Welding Supply

Utah: Salt Lake City—The Galigher Co.

Washington: Seattle, Spokane—J. E. Haseltine; Spokane, Yakima—Industrial Air Products

West Virginia: Bluefield—Bluefield Supply; Charleston—Virginian Electric; Huntington, Logan—Logan-Hardware & Supply

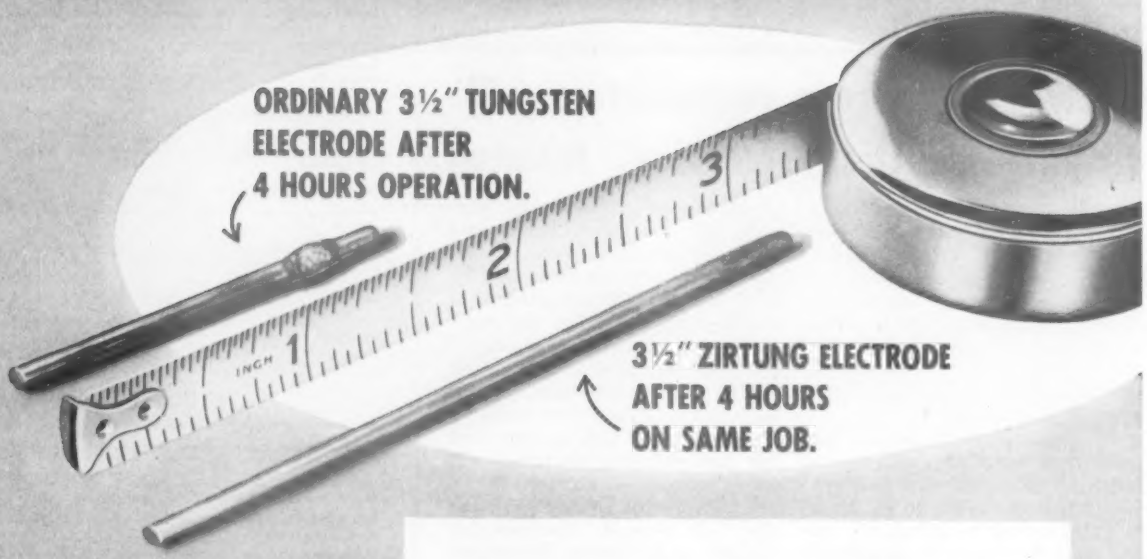
Wisconsin: Milwaukee—Machinery & Welder

Alaska: Anchorage—Northern Supply

Canada: Toronto—Canadian G.E.

Hawaii: Honolulu—American Factors, Ltd.

ZIRTUNG Beats 'em all



ZIRTUNG STANDS OUT BECAUSE IT *STANDS UP!*

Far outlasts ordinary tungsten electrodes!

The photo tells the story! The ordinary tungsten rod lost 2 inches in four hours. But ZIRTUNG, on the same job in the same time, lost *only ½ an inch!*

An exclusive Sylvania Development

This time-saving, money-saving rod is an amazingly improved tungsten-zirconium alloy, developed exclusively by Sylvania for inert gas electric arc welding. Operates in the same current ranges as thoriated tungsten. And it contains no radio-active material.

You'll find Zirtung great for mild steels, aluminum and magnesium. So order Zirtung today! Your nearest Sylvania Welding Distributor is the man to call. He also handles Sylvania pure tungsten and thoriated tungsten electrodes. For further information address: Sylvania Electric Products Inc., Dept. 3T-4309, 1740 Broadway, New York 19, N. Y.

Why Zirtung Saves Time and Money

1. **Greatly reduced electrode consumption.**
2. **Far less contamination from material being welded.**
3. **Self cleans contamination without loss of electrode.**
4. **Greater arc stability.**

SYLVANIA

LIGHTING · RADIO · ELECTRONICS · TELEVISION

In Canada: Sylvania Electric (Canada) Ltd., University Tower Bldg., St. Catherine St., Montreal, P. Q.

How to STEP UP PRODUCTION

with CARBORUNDUM's Abrasive Belts

This **FREE** booklet shows you how!

● This new booklet by CARBORUNDUM will help you determine what grinding jobs you may be able to do better with abrasive belts...and give you the facts you need to make your present belt grinding operations more profitable.

Actual case histories—complete with photographs, facts and figures—show you the way many companies have increased production and lowered costs by switching to CARBORUNDUM's abrasive belts and contact wheels. In some cases the change was to belts from grinding wheels or set-up wheels; in others, the change was made from other types of belts and contact wheels to those by CARBORUNDUM.

USE THE COUPON

to send for your copy today. And call your CARBORUNDUM distributor or salesman—he's ready to help you step up production, cut costs.

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Niagara Falls, New York

Please send me a copy of "Abrasive Belts by CARBORUNDUM."

NAME _____ TITLE _____

COMPANY _____

STREET AND NUMBER _____

CITY _____ ZONE _____ STATE _____

☐ I'd also like a FREE copy of the "COATED ABRASIVE SELECTOR"

CARBORUNDUM

TRADE MARK

...the ONLY source for EVERY abrasive product you need

"Carborundum" is a registered trademark of The Carborundum Company, Niagara Falls, N. Y.

82-91r

This installation *automatically* salvages useable flux and returns it to hopper of welding head. Circular magnets are being welded.

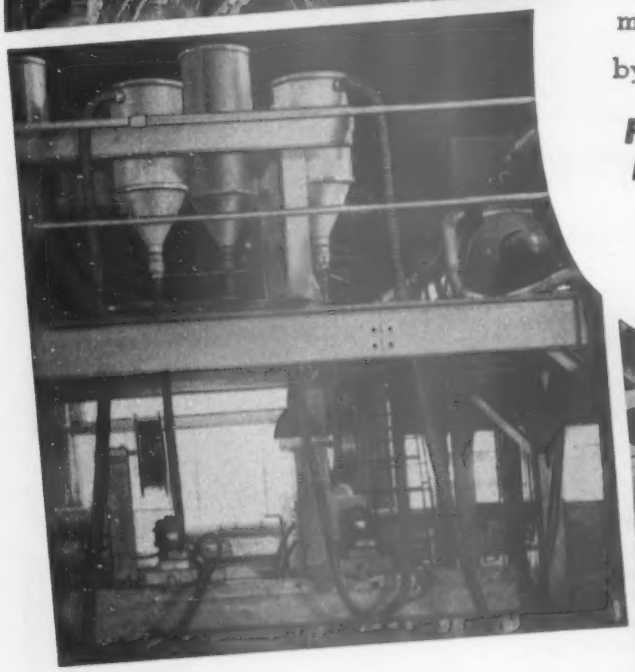
INVINCIBLE
Flux Recovery Systems

Quickly Repay Their Costs

• On submerged arc welding jobs, Invincible Flux Recovery Units save money by: **1** Salvaging *all* unfused flux, **2** Operating far more efficiently than manual methods, **3** Reducing welding rejects by removing all fine dust (flux flour).

FREE FOLDER on FLUX RECOVERY

Describes and illustrates the complete Invincible line . . . *send for your copy Now!*



Flux is being recovered simultaneously from *2* welding heads on this installation. Water tanks are being welded.

Welding locomotive parts. *Only* primary separator tank is elevated, thus eliminating need for another supporting jig.

INVINCIBLE VACUUM CLEANER MFG. CO.

DOVER, OHIO

FOR 40 YEARS, LEADERS IN INDUSTRIAL VACUUM EQUIPMENT

AIRCO HELMETS: A complete line of helmets and face shields in a wide variety of styles and types. In any kind of service, these Airco products provide the greatest possible operator safety and comfort.

AIRCO HOLDERS: Famous Jackson jaw-type and Martin Wells screw-type holders. Nineteen Jackson models, from 200 to 500 amperes. Six Martin Wells, including the Heavy Duty Model 6S — the only holder on the market that will handle 700 amperes!

AIRCO GLOVES: The same quality that makes other Airco accessories the best value you can buy extends to welders' gloves and leather sleeves.

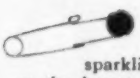
AIRCO CABLE AND CONNECTIONS: Unrivalled dependability, long life and flexibility. Sizes from 4 to 4/0, for wide range of amperages at varying distances from welding machine. Make sure of good connections with Airco ground clamps, cable splicers, Quik-Trik cable connectors and cable lugs.

RELY on AIRCO quality in both fields

. . . And soapstones, tip cleaners, clamps, circle cutting attachments, carrying cases, carbon pencils, carbon torches, graphite electrodes, chipping hammers, brushes . . . you name it — Airco has it at low prices. Call your Airco dealer or write us directly for your copy of Catalog 13, "Airco Welding Accessories," and complete price list.

AIRCO GOGGLES: for gas welding or cutting. Precision made, they afford excellent ventilation with maximum eye protection. All types exceed National Bureau of Standards requirements.

AIRCO CYLINDER TRUCKS: Make your welding and cutting outfit easily portable with an Airco two-wheel hand truck. Strong, rigid, welded steel frame; broad steel platform. Five models offer wheel sizes and styles for every type of surface.



AIRCO SPARKLIGHTERS: Save time and trouble with the standard Airco sparklighter and its replaceable round file, or the heavy-duty Airco Tri-Flint model, which carries three flints in a rotating holder.

AIRCO TWIN-HOSE: Two lines of hose moulded into a single, light, flexible unit. Close, tight braid permits thicker rubber cover for greater wear resistance.

AIRCO®

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Air Reduction Sales Co. • Air Reduction Magnolia Co. • Air Reduction Pacific Co.

Represented Internationally by Airco Company International

Divisions of Air Reduction Company, Incorporated

at the frontiers of progress you'll find

This vacuum tank

This cyclone separator

BOTH MADE BY WELDING

The vessel at left in the photograph is called a cyclone separator. It is 48 in. in diameter, and about 13 ft high. Its shell thickness is ⅜ in., its weight 5706 lb.

Its big brother, at the right, is a vacuum condensate tank, 72 in. in diameter, 14 ft, 10 in. high, ⅜ in. in shell thickness, and weighing 6452 lb. Both vessels are for use in a desulphurizing unit for a manufacturing plant, and were turned out in our Weldments Shop.

You may never have occasion to use anything as formidable-sounding as a cyclone separator, or a vacuum condensate tank. But if you build any kind of mechanical equipment, we strongly suggest that you look into the worthwhile advantages of Bethlehem Weldments.

Here's What You Get with Bethlehem Weldments

ECONOMY. There's no excess weight with Bethlehem Weldments, nor any sacrifice of rigidity. And of course weight-reduction often makes possible a lower manufacturing cost.

VERSATILITY. With Bethlehem Weldments there's no limit to the sizes or types of shapes that can be welded. These weldments can be used effectively as simple parts, or as sections of intricate assemblies.

FREEDOM OF DESIGN. You have absolute freedom of design with Bethlehem Weldments, because the steel can be bent, pressed or shaped prior to welding, without affecting its physical structure.

FREEDOM OF USE. Bethlehem Weldments can be used alone. Or they may be combined with forgings, castings, or both.

If you would like to discuss with a Bethlehem representative the advantages to be derived through the use of weldments, please write or phone the nearest Bethlehem office.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. *Export Distributor:* Bethlehem Steel Export Corporation

BETHLEHEM WELDMENTS

BETHLEHEM STEEL

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Cost cutting
Hard Surfacing
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Low Hydrogen*- Hard Surfacing

ELECTRODES

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McKay Hardalloy Electrodes are the solution to your Hard Surfacing problems. Hard Surfacing Manuals, covering your specific application, are available upon request.

This complete new line of Hard Surfacing Electrodes was developed by The McKay Company, a leader in the stainless and alloy electrode field for many years. To cut costs and save money let us help you make the proper selection of the McKay Hardalloy Electrode for your specific application.

**Packaged in hermetically sealed cans.*

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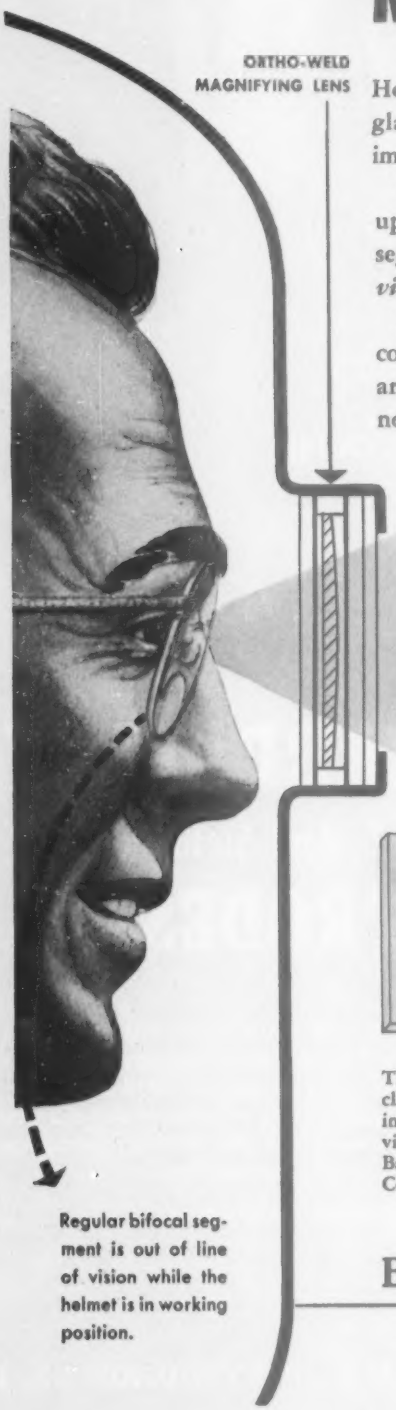
BAUSCH & LOMB

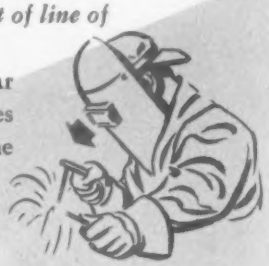
NEW! Ortho-Weld MAGNIFYING LENSES



Here's greatly improved vision for the welder who wears glasses with bifocal lenses. Ortho-Weld magnifying lenses improve his comfort, skill and productivity.

With Ortho-Weld, the worker gets the clear, sharp, close-up view normally provided by the near point, or reading segment of his bifocals—the segment which is *out of line of vision* while his helmet is in working position.

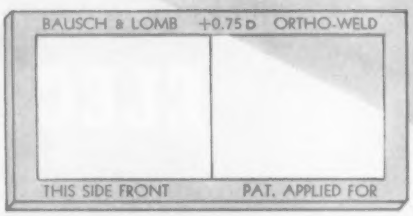
Easily inserted between the filter lens and rear cover plate in the lens holder, Ortho-Weld lenses are available in 4 "strengths," or powers, fitting the needs of most welders who wear bifocal lenses.



Welders get clear, comfortable, close-up view . . .

for welders who wear bifocal lenses . . .

at all angles . . . up, down, and to the side.



The Ortho-Weld is precision molded in one piece from crystal-clear lucite. It consists of two lenses surrounded by a supporting frame. Each lens is adequately centered for comfortable vision, provides full use of the helmet window. Ask your supplier of Bausch & Lomb protective eyewear, or write: Bausch & Lomb Optical Company, 90721 Smith St., Rochester 2, N. Y.

Regular bifocal segment is out of line of vision while the helmet is in working position.

BAUSCH & LOMB *Safety Eyewear*

1853/1953 INTO A NEW CENTURY OF OPTICAL PROGRESS
BAUSCH & LOMB CENTENNIAL

ANACONDA
WELDING RODS

PROUD MANUFACTURER. Elmer Rulf points to weld made with ANACONDA-997 (Low Fuming) Rod on side piece of generator frame made of steel tubing. None of the 2,880,000 welds made on these frames has ever pulled apart.

2,880,000 welds

. . . without one customer complaint

"IN four years, we've turned out 96,000 generator frames," says Elmer Rulf, President, Eldon Mfg. & Engr. Co., Inc., Milwaukee, Wisconsin. "Each steel-tube frame requires 30 braze connections. On this job alone, we figure we've made 2,880,000 welds – all with ANACONDA-997 (Low Fuming) Bronze Welding Rods. We haven't heard a single complaint.

ELDON'S WELDER, JACK CORBETT, uses ANACONDA-997 (Low Fuming) Rod to make 1 of 30 braze connections the frame needs. Eldon also brazes lawn-mower and chain saw handles, flexible tube for air ducts.

"ANACONDA-997 Bronze Rods give strong, sound welds every time. They have a low melting point, tin easily and flow freely. Work needs less preheating, too. We do the job faster and at lower cost–with no danger of warping or cracking. Our welds are cleaner, better looking and the welds are far easier to finish."

Badger Welding Distributors, who supply Eldon with all their ANACONDA Rods, hear many such success stories. Your distributor can tell you how ANACONDA Rods can boost your own production efficiency. ANACONDA Welding Rods for many types of repair and production jobs are available from distributors throughout the United States and Canada. For latest tips on welding, write for Booklet B-13 to: *The American Brass Company, Waterbury 20, Connecticut. In Canada: Anaconda American Brass Ltd., New Toronto, Ont.* 53164

braze or weld with confidence—

ANACONDA®
welding rods

Now adding to our electrode production...

World's most

modern welding electrode plant!

BETTER WITH THE BEST IN WELDING ELECTRODES

Additional capacity for the production of A. O. Smith welding electrodes is represented by this "automatic factory," now in operation near Lancaster, Pennsylvania. Consistently high quality shielded-arc electrodes are being produced here by automatic machines in a glazed tile structure that assures the cleanliness needed for optimum quality control.

Maximum uniformity of electrodes is assured by rigid production controls including controlled air throughout the plant and the industry's newest and most efficient baking ovens. Straight-line production, with raw materials entering at one end and finished, packaged electrodes emerging at the other . . . means top quality electrodes for your production requirements.

Your demand for quality electrodes can be more quickly satisfied because of this new facility. The Lancaster plant will enable us to serve our Eastern customers on practically an overnite basis, as well as improving delivery to A.O. Smith users everywhere. For complete information on the entire A.O. Smith electrode line . . . as well as on machines and accessories, write:
A. O. Smith Corporation, Welding Products Division,
Dept. WE-953, Milwaukee 1, Wisconsin.

A.O.Smith
CORPORATION

WELDING PRODUCTS DIVISION, MILWAUKEE 1, WISCONSIN
INTERNATIONAL DIVISION: MILWAUKEE 1, WISCONSIN

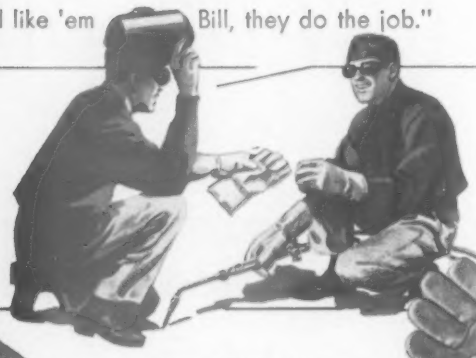
FLEXIBILITY
HEAT RESISTANCE
LONG WEAR

You'll Get All 3 in AO Heavy Duty Welders' Gloves and Mittens!

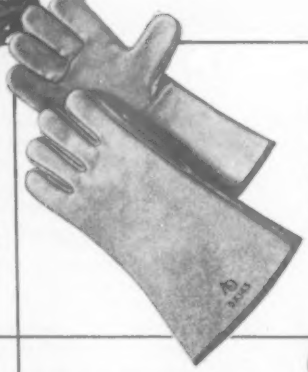
HAND PROTECTION

14" length . . . soft finish . . . heavy-weight smooth lining on back for greater protection . . . edges bound with tape and stitched — these are some of the quality features that lift these products out of the "just another glove" class! Gloves are chrome-tanned horsehide; mittens, chrome-tanned cowhide. For the very best in hand protection, call your AO Safety Products Representative.

"I like 'em Bill, they do the job."

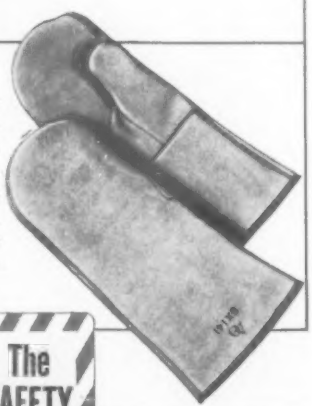


5X163 GLOVE—Offers exceptional resistance to heat on gas welding and heaviest amperage electric welding. One-piece back and palm. Welted at all vulnerable seams. Extra heavy lining on back of hand. Sizes 10, 11, 12.



5X143 GLOVE—Gunn cut—one-piece back reduces number of seams to minimum. Lined on back of hand from wrist to finger tips. Welted at all vulnerable seams for extra strength. Sizes 10, 11, 12 are available.

TX100 GLOVE—Gunn cut—one-piece back. DOUBLE THICKNESS OF LEATHER ON FIRST FINGER AND THUMB, also on part of palm. Lined on back of hand from wrist to finger tips. Full gauntlet, sizes 10, 11, 12 available.



6X141 FULL MITTEN—One-piece back and palm. Crotch of thumb is reinforced with wide leather strap. All vulnerable seams are welted. Back of hand is lined. Size 11 only. (For one-finger mitten, ask for 6X142.)

NOTE: Not shown is the AO 3013 Glove with a leather patch on back of the hand for added protection against sparks and molten metal. Both thumb and first finger are reinforced with a leather patch. Also reinforcing leather strap around thumb. Ask to see this model, also companion model 3014 featuring a flap that covers back of the hand and back of the fingers; also AO TX 200 Glove with welted seam at base of palm and wrist, one-piece back and wing thumb.

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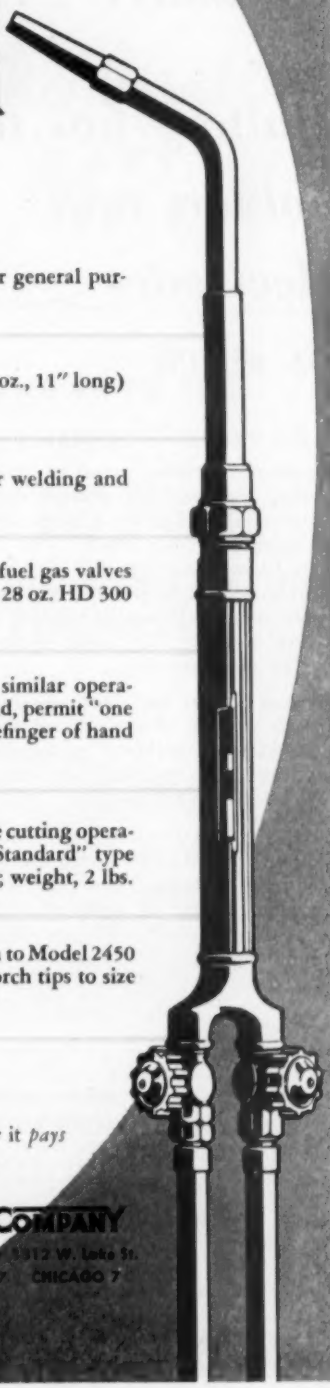
American Optical
SAFETY PRODUCTS DIVISION

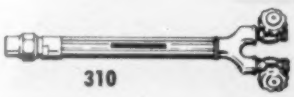
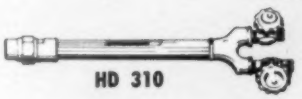
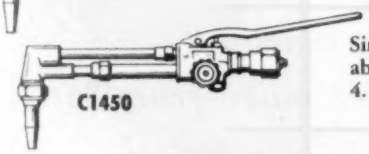
The SAFETY ZONE

Stay in the Safety Zone with AO Safety Equipment

SOUTHBRIDGE, MASSACHUSETTS • BRANCHES IN PRINCIPAL CITIES

Which of these most popular models by VICTOR *best fits your needs?*



300 SERIES WELDING TORCHES	DESCRIPTION, APPLICATIONS
315	A compact 18-oz., 9-inch torch ideal for general purpose welding and cutting.
 310	A medium weight and length torch (21 oz., 11″ long) for all around use.
300	A long (14″) torch for users of larger welding and heating nozzles; weight 24 oz.
 HD 310	Heavy duty models with high capacity fuel gas valves for large gas flows. HD 310—11″ long, 28 oz. HD 300—14″ long, 32 oz.
P 310	Especially designed for pipeline and similar operations. Gas control valves, at forward end, permit "one hand" adjustment with thumb and forefinger of hand holding torch. 9″ long, 22 oz.
CUTTING ATTACHMENTS	
2450	Handles a full range of general purpose cutting operations up to approximately 8″. Uses "Standard" type cutting tips up to size 5. Length is 13″; weight, 2 lbs.
 C1450	Similar in size, weight and construction to Model 2450 above, but designed for smaller "C" torch tips to size 4. Cuts to approximately 6″.

Look for the Victor dealer sign!

—Ask him to show you why it *pays* to standardize on VICTOR.

Dealer Inquiries Invited VICTOR **for welding**

VICTOR EQUIPMENT COMPANY

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9-1

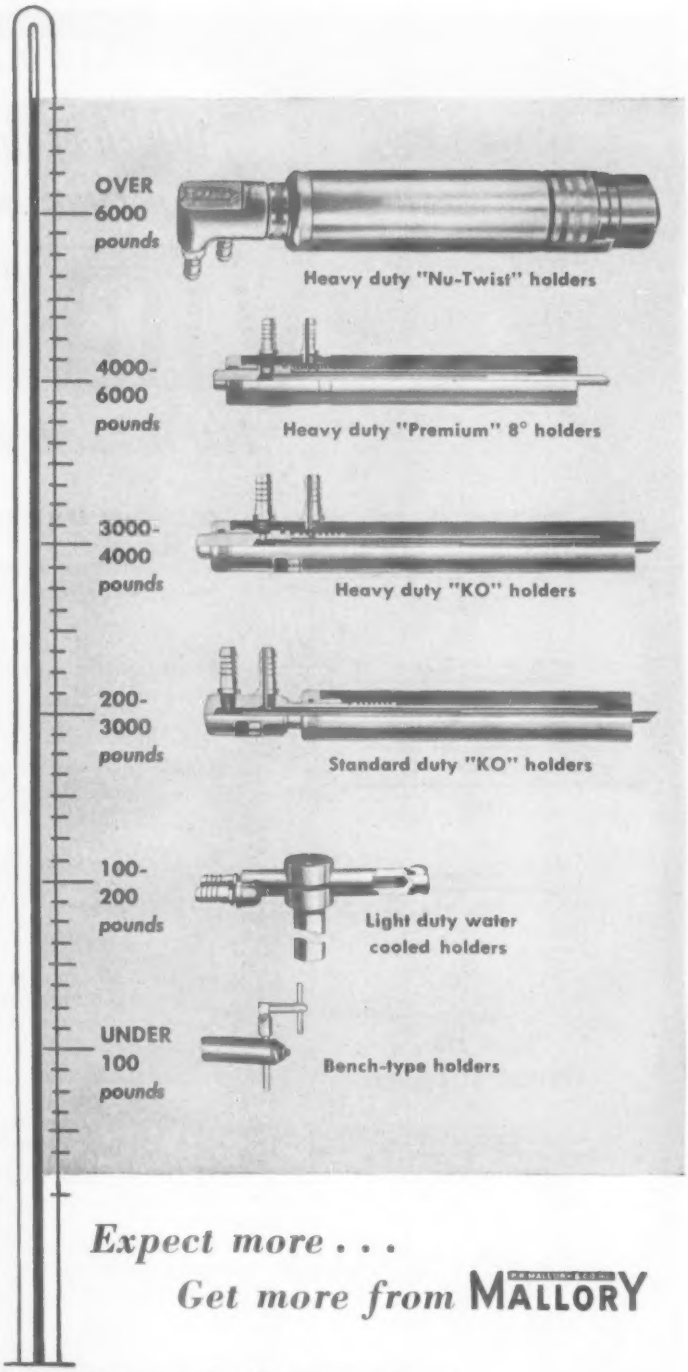
You Name The Welding Pressure . . . .

Mallory has the holders and electrodes in stock

Resistance welding pressures from under 100 pounds to over 6,000 pounds can be handled by standard Mallory holders and electrodes . . . available from stock. The new Mallory "Nu-Twist"* holders and electrodes will perform in the high pressure ranges needed for welds to meet all present military specifications . . . as well as the most demanding commercial requirements.

Because holders and electrodes are available in a wide variety of shapes and sizes, standard units can be combined to handle practically any resistance welding job without the cost or delay of special designs.

Like to see our complete line? Then write to us, or have your Mallory distributor drop by with a copy of Catalog 550C. See for yourself the complete range of holders, electrodes and accessories that are on the shelf for immediate delivery.



Expect more . . .
Get more from MALLORY

In Canada, made and sold by Johnson Matthey and Mallory, Ltd., 110 Industry Street, Toronto 15, Ontario.

RESISTANCE WELDING ELECTRODES, HOLDERS, RODS AND BARS, DIES, CASTINGS, FORGINGS

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SERVING INDUSTRY WITH THESE PRODUCTS:
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For information on titanium developments, contact Mallory-Sharon Titanium Corp., Niles, Ohio

the unseen MR. "X"

WHO PUTS THE SOMETHING "X TRA" IN

BURDOX

WELDING AND CUTTING EQUIPMENT

BURDOX

Provides every product...every process... to fit every purpose best

We call him Mr. "X"—not because he is an unknown quantity but rather because he represents an idea, a tradition, a way of doing business. Mr. "X" stands for the many highly trained welding experts who design and produce BURDOX products for every welding and cutting process—men whose vast experience and superior "know-how" adds that extra "something" to every BURDOX product. These men work toward the traditional BURDOX goal: *find a way to do it better, faster, cheaper, easier.* So regardless of what your needs are—welding and cutting equipment, industrial gases or safety equipment—there is a BURDOX product that can take the guess-work and delay out of solving your *particular problem.* Don't just buy welding equipment—buy BURDOX and save man-hours *and* money. *If you do not have the Burdett catalog be sure to write for your free copy now.*

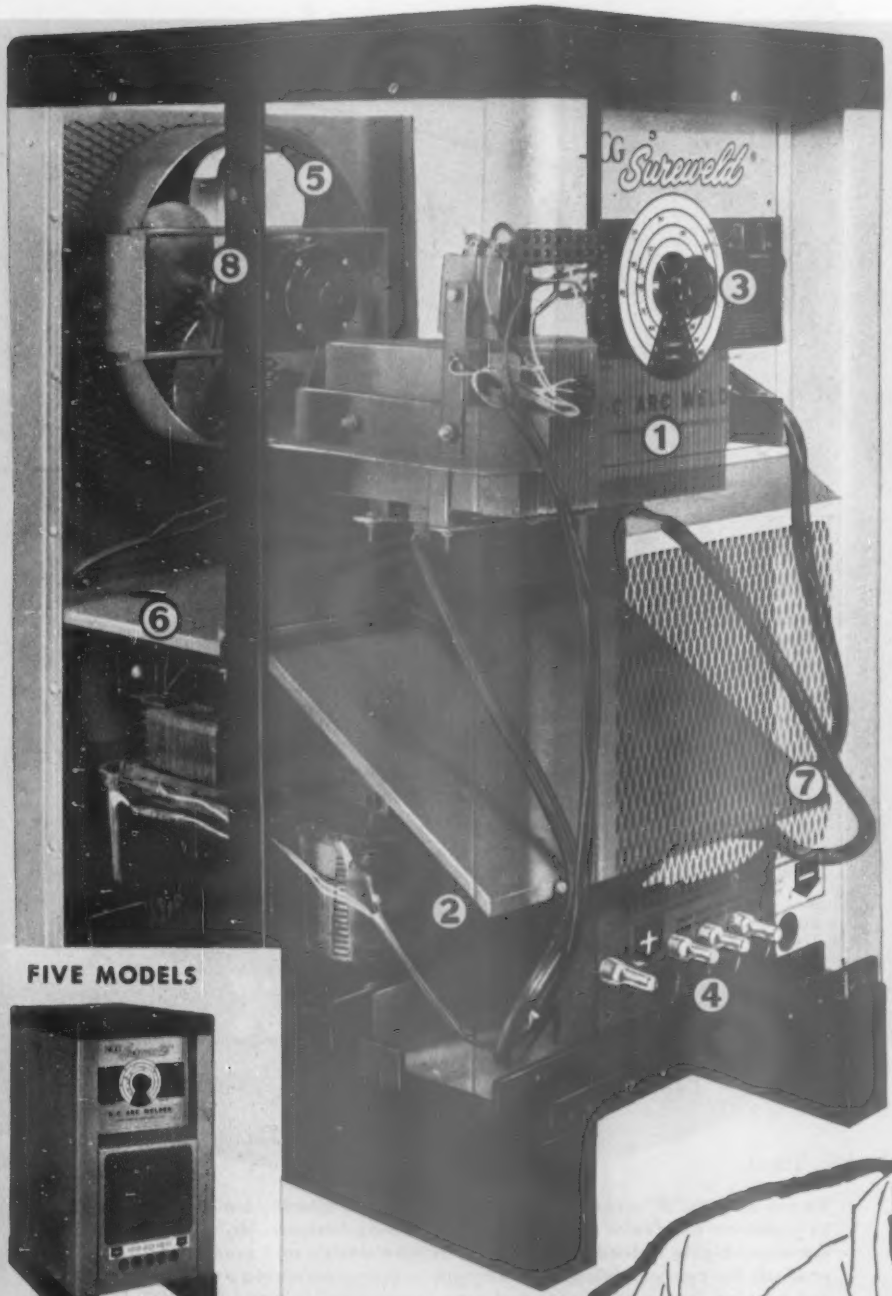
THE BURDETT OXYGEN CO.

GENERAL OFFICES: 3302 LAKESIDE AVENUE, CLEVELAND 14, OHIO

BRANCHES
AKRON CINCINNATI
COLUMBUS MANSFIELD

PLANTS
CLEVELAND, DAYTON & YOUNGSTOWN, OHIO
LOS ANGELES, CALIFORNIA

The new NCG *Sureweld*



FEATURES LIKE THESE MAKE SUREWELD YOUR BEST BUY

1 **Selenium Rectifier Stack** is constructed of sturdy, heavy gauge metal plates, extra large in surface area for maximum cooling of rectifier. Special thermostat protects stack from overheating.

2 **Exclusive Transformer Design** (patent applied for) results in a rectangular unit with extremely low center of gravity. Weight of welder is up to 50% less than equivalent motor generator sets—requires far less floor space.

3 **Knob-type Current Control** with calibrated dial and Line Switch are conveniently located on front panel. Welder also available with hand or foot operated rheostat for remote control.

4 **Complete Current Range** is obtained in three steps by plugging into one of three receptacles. Low current resistor (optional) gives fourth range for very low currents. Welding leads have "quick disconnect" plugs.

5 **Powerful, Heavy-duty Cooling Fan** safeguards rectifier stack and transformer unit against harmful overheating.

6 **Primary Terminal Board,** accessible through hinged door at back of welder, is clearly marked for changing connections for either 230 or 460 volts, 3-phase, 60 cycles. Available for special voltages upon request.

7 **Sturdy Drip-proof Cabinet** has flush-front construction and recessed control panel and electrode receptacles. Entire cabinet is easily removed for inspection.

8 **Lifting Hooks** permit easy, safe hoisting of welder.

FIVE MODELS

NCG®

EVERYTHING FOR WELDING

D-C Rectifier Arc Welder

Today's most advanced D-C arc welder design

Makes D-C welding easier, more efficient than ever before . . . costs less to operate and maintain!

Everything you've ever wanted in a D-C welder —whether you operate one machine or hundreds—is built into this new Sureweld Rectifier Arc Welder . . .

MADE TO ORDER FOR *YOUR* WORK

Right from the start you get the one right welder for *your* job . . . not too big . . . not too small. That's because there are five different models to choose from, providing a current range of from 2½ to 750 amps.

CONVENIENT CURRENT CONTROL

Current adjustments couldn't be easier. You simply dial the desired output current. The knob-type rheostat provides continuous current control within each of three ranges . . . *all electrically*. Foot or hand operated rheostats are available for remote control.

OUTSTANDING ARC CHARACTERISTICS

Even at the lowest current settings, it produces an absolutely stable, easily handled arc. What's more, an A-C ripple in the output current, which tends to reduce arc blow, greatly improves weld speed and quality.

QUIET OPERATION, LOW MAINTENANCE

It has no moving parts (except for cooling fan) . . . no brushes, bearings and commutators to replace and repair. Nothing to wear out or cause noise. Operation is *quiet*. Maintenance costs are negligible.

It cuts costs in other ways, too . . .

LOWER POWER COSTS

Compared to motor generator sets, electrical efficiency is substantially higher. Starting current is lower. Power consumed when idling is less.

BUILT TO LAST

The Sureweld stands up better, too, because it's made better . . . *both inside and outside*. The cabinet has flush-front construction for safety, is extra sturdy, drip-proof. The heavy-duty cooling fan and thermostat protect the welder against overheating . . . prolong life of both transformer and rectifier stack.

Before you decide on any D-C machine, see the new Sureweld Rectifier Welder at your nearest NCG branch or authorized NCG dealer. Or simply mail the coupon for complete literature.

NATIONAL CYLINDER GAS COMPANY
840 N. Michigan Avenue, Chicago, Illinois
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840 N. Michigan Ave., Chicago 11, Illinois

☐ Please send Illustrated Bulletin NH-114 containing full details of new Sureweld D-C Rectifier Welder.

☐ Please arrange, at no obligation to me, a demonstration of the new Sureweld D-C Rectifier Welder.

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Job-Matched PREST-O-LITE Torches

for every soldering, heating, and brazing need

CONVENIENT
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CLEAN . . . FAST
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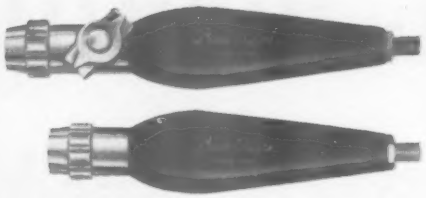
ECONOMICAL

Whatever your soldering, heating, and brazing needs, there's a PREST-O-LITE outfit to meet your exact requirements. Because you "tailor-make" your own outfit. You choose the torch handle, stems, and accessories you need. And you buy only what you need for the work you want to do—no "extras."

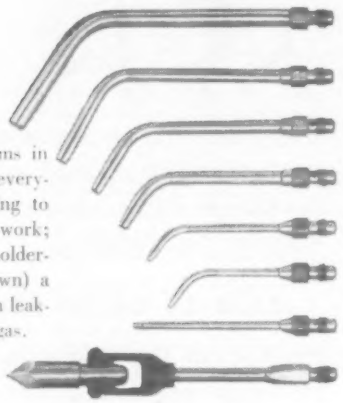
PREST-O-LITE outfits, burning acetylene from small portable tanks, are lightweight and completely portable. A painter on a scaffold "burns" paint with his outfit as easily as any plumber in a cellar "sweats" a joint with his. Outdoors, the air-acetylene flame lights instantly at full working heat regardless of wind and weather. Indoors, it burns clean, without smoke or fumes. And there's no liquid fuel to spill—no pumping, priming, or warmup to waste time.

Electricians, autobody repairmen, radio and television men — practically all installation and maintenance men—are finding new time- and moneysaving uses for PREST-O-LITE torches every day. Refrigeration engineers find the PREST-O-LITE Leak Detector an indispensable tool in their kit. For further information, see your local LINDE jobber today, or write to LINDE AIR PRODUCTS COMPANY, a Division of Union Carbide and Carbon Corporation, 30 East 42nd Street, New York 17, N. Y. In Canada: Dominion Oxygen Company, Limited, Toronto.

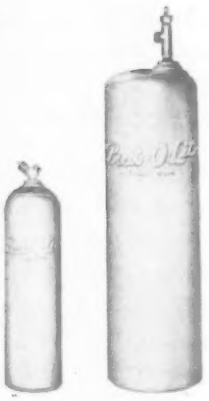
Get it from Your LINDE Jobber



YOUR CHOICE of standard torch handle or precision model with gas-saving shutoff valve and built-in pilot flame control. All stems fit interchangeably on either handle.



YOUR CHOICE
of seven open-flame stems in job-matched sizes for everything from heavy heating to fine, electrical soldering work; pointed or chisel type soldering irons; and (not shown) a paint burning stem and a leak-detector for refrigerant gas.



YOUR CHOICE
of MC Tank (10 cu. ft.) or B Tank (40 cu. ft.) containing acetylene for up to 160 operating hours, depending on size of torch stem. Empties immediately exchangeable for full tanks at cost of gas only.

FOR PEAK EFFICIENCY
Fully adjustable R-411 regulator automatically maintains gas flow at precise pressure for best results on each job. Eliminates work interruptions for frequent readjustment of tank valve as tank empties. Also saves gas by preventing use of excessive pressures.

Complete Outfits, less tank, start as low as **$7.45.**

The term "Prest-O-Lite" is a registered trade-mark of Union Carbide and Carbon Corporation.

THESE REPOINTERS ARE
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Because they are AMSCO "Wear-Sharp"* Repointers that stay sharper with use...

Service life plus! The combination of Amsco Manganese Steel and the hardness of AMSCOATING with Amsco Hardfacing electrodes—gives you a tooth that wears evenly and stays sharp longer.

Note that only certain grooves (shown in red at left) are Amscoated—the grooves on the outside and the one on each end. This is the area where ordinary teeth wear fastest. The hardened corners on the "Wear-Sharp" equalize wear along the entire cutting edge and eliminate rounded, blunted corners that cut digging speed and waste power.

Field reports indicate that "Wear-Sharp" repointers will give as high as six times the life of other teeth.

In these photographs at right of a typical case history, old repointers lasted from three to four days. Amsco "Wear-Sharp" repointers lasted 32 days—eight times the service life of the repointers previously used.

"Wear-Sharp" repointers installed on two dipper teeth showing condition of old teeth.

Dipper teeth after 257 hours of use with "Wear-Sharp" repointers used. New "Wear-Sharps" are ready for installation.

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TOOL-ARC ELECTRODES SLASH TOOL AND DIE MAINTENANCE COSTS!

WITH TOOL-ARC

★ Life of tools and dies can be prolonged indefinitely

★ Purchase of new tools and dies is kept to a minimum

★ Produce dies compositely at half or less normal cost

★ Conserve materials and reduce new die requirements

★ Reduce production delays, due to tool or die failure

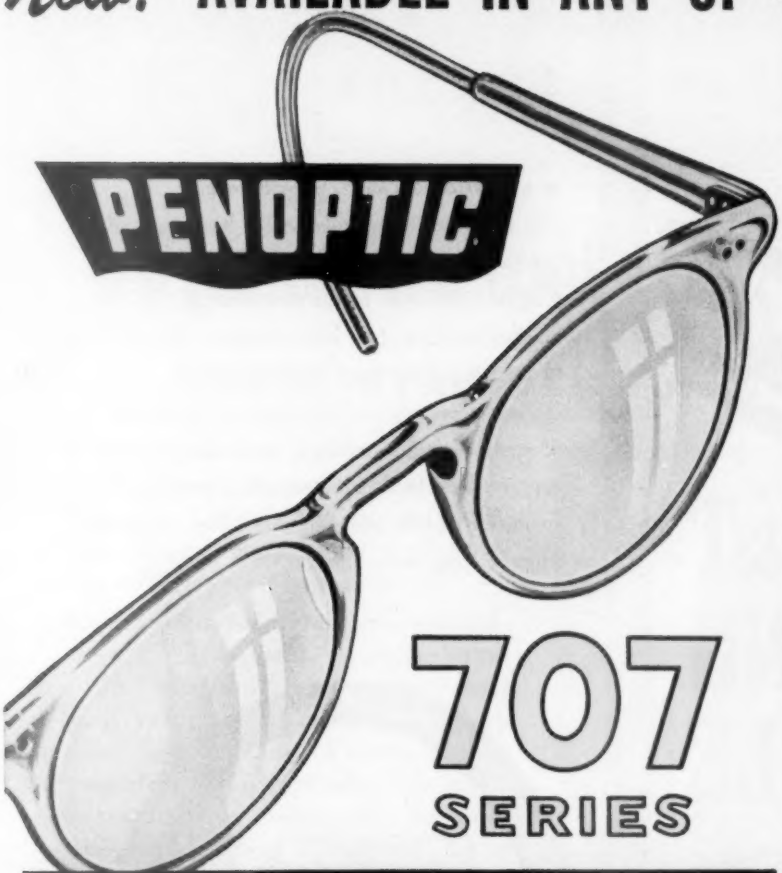
Investigation of what *Tool-Arc* electrodes can do for you may be an eye-opening experience. There's a *Tool-Arc* electrode to match each of the five basic types of tool and die steels: (1) Air Hardening, (2) High Speed, (3) Hot Work, (4) Oil Hardening, and (5) Water Hardening ... plus *Tool-Arc* Work Hardening electrodes for welding of forging, drawing, and forming dies. *Write for Tool-Arc Bulletin AR52-1.* Alloy Rods Company, York, Pennsylvania.

Manufacturers of *Arcaloy* stainless steel electrodes • *Bronze-Arc* phosphor bronze electrodes • *Nickel-Arc* and *Nickel-Arc 60* electrodes for cast iron • *Wear-Arc* hard-facing electrodes • *Weld-Arc* low hydrogen electrodes. Write for Bulletins on these products.

AR-16

Alloy Rods Co.
YORK, PA.
NO FINER ELECTRODES MADE ANYWHERE

Now! AVAILABLE IN ANY OF 4 MODELS!



PLASTIC FRAME SPECTACLE TYPE SAFETY GOGGLES

Direct From the Manufacturer

The Penoptic "707 Series" goggles assures workers of dependable protection, comfort and a distinctly personal appearance. All models are of tough, lightweight, non-inflammable plastic. High line style, drop-eye shape and flesh color combine to satisfy workers' demand for a more personal look. This new series offers a choice of:

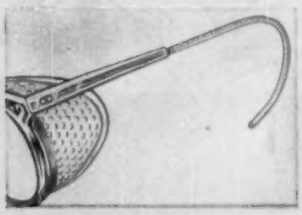
- Spatula or cable type temples . . .
- Adjustable rocker or regular nose pads . . .
- And contour-fitted side shields . . .

These models in a full range of bridge widths and lens sizes make possible combinations adaptable to many different operations throughout industry. Penoptic's manufacturer-to-you distribution policy now offers new opportunities to save with safety.

For descriptive literature and prices write directly to . . .

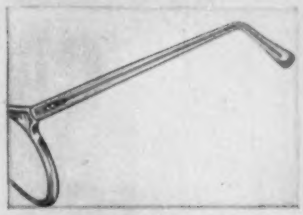
MODEL 707

Wire core temples with cable wound ends.



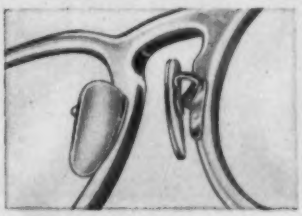
MODEL 707S

Plastic side shields, wire core temples.



MODEL 707P

Spatula temples, wire reinforced.



MODEL 707R

Rocker-type nose pads supported by adjustable metal arms.

PENNSYLVANIA OPTICAL COMPANY

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Known for Fine Ophthalmic Products Since 1886

USE M&T WELDING CABLE FOR GIVE and TAKE

M & T WELDING CABLE* is built to *give* maximum flexibility—*take* severe handling and service conditions. . . . Its tough, resilient NEOPRENE cover resists attack of oils, acids, alkalies, sunlight, heat and abrasion—provides easier flexing for more convenient and efficient operation. . . . Conductor is composed of many carefully stranded, fine, soft annealed copper wires—thin paper separator protects conductor strands and simplifies jacket stripping when making connections.

For more particulars on this improved welding cable—and an outstanding line of power cable, too—contact your distributor or nearest M & T office.

*Meets A.S.T.M. Specification D-752 (Neoprene sheath for heavy-duty service).

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FOR HIGH-PRESSURE GASES

Wherever welding is done

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Perhaps your men pay little attention to the *brand* of welding cylinders they use . . . but throughout the welding industry today, *safety* and *quality* are commanding new respect.

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Capacities range from 14 to 400 cubic feet . . . each cylinder is manufactured to I.C.C. Specifications . . . there are both domestic and export types. *Write today . . . or use the handy coupon . . . to obtain a catalog and current prices.*

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( ) Send us your 24-page Catalog on Harrisburg Cylinders for High-Pressure Gases.

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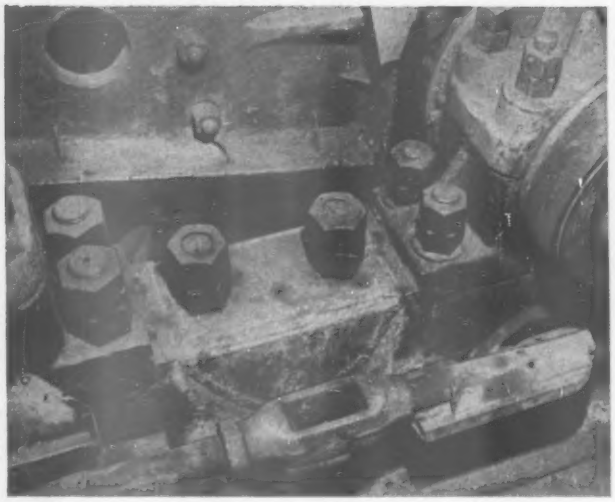
How **Ni-Rod "55"** Helped the Freighters Beat the Ice Jam



A fracture in this cast iron bearing support could have held up coal loading for days at the P. & E. Coal Dock Co. in Erie, Pa. And at the rush season just before the ice jams, too! But work was resumed after only 20 hours downtime — thanks to Ni-Rod "55."

It happened at the peak of the season — workers were loading coal 24 hours a day so the freighters could get away before the Great Lakes became jammed with ice.

Suddenly a jolt and the winch drum of a coal loader fractured its cast iron bearing support.

Time couldn't be spared to dismantle the hoist for repairs — too many 70-ton coal cars were waiting to be emptied.

So a mechanic tried temporary repairs by cutting and welding a channel of one-inch boiler plate and setting it into the hollow under the 1/8" crack as brace. Then he welded a turnbuckle on to hold the casting together. It held but the casting moved and vibrated as the hoist was operated.

This couldn't go on so they called a master welder in on the job.

He examined it and felt that a permanent repair could be made with Ni-Rod "55"® — the electrode especially developed for making strong welds in cast iron, or for joining cast iron to steel.

Cutting one-inch steel boiler plate to fit, he welded it to the sides of the casting with 5/32" and 3/16" diameter Ni-Rod "55." Then he cut and welded another piece of the one-inch steel boiler plate over the top of the casting — covering the fracture. Now the casting was supported inside and out by saddle-shaped splints of boiler plate. All in all the job required only 20 hours and 35 pounds of Ni-Rod "55." And it saved several days of downtime.

The loader was back on the job loading the freighters at a rate of 1,500 tons per hour on a round-the-clock schedule to beat the ice jams.

You'll find Ni-Rod "55" will give you sound machinable, crack-free, non-porous welds in cast iron, Ductile iron, Ni-Resist®, special alloy irons and when welding cast iron to steel. Usually Ni-Rod "55" can be used without pre-heating or post-heating. And it provides stable-arcing with a minimum of spatter to give a smooth bead contour.

Consult your distributor of Ni-Rod "55" electrodes for the latest information on availabilities. Remember, too — it always helps to anticipate your requirements well in advance. And if you have a special cast iron welding problem, it will pay you to call on him for help.

Discuss your welding problems with Inco's welding engineers at the National Metal Exposition, October 19-23. (Booth 332, Public Auditorium, Cleveland, Ohio)

THE INTERNATIONAL NICKEL COMPANY, INC.

67 Wall Street, New York 5, N. Y.

Dependable Westinghouse A-C Welders pay off...this time for Avery and Saul Company

The 40 Westinghouse A-C Welders (from 200 to 1500 ampere capacity) at the Avery and Saul Company, Cambridge, Massachusetts, are on the job 24 hours a day—every day. Their outstanding record—not one single case of out-service for repairs—has contributed to this company's rapid growth as recognized "specialists in steel plate fabrication".

Even the toughest corner weldments are no problem to this production-minded fabricator. Absence of arc blow and ease in using heavier electrodes with higher current insure good welds in all positions—at higher speeds. And since power source is an important factor in their operation, Avery and Saul was quick to recognize a sharp reduction in power costs, too. With the built-in power-factor correction feature on the Westinghouse a-c sets, their demand rates are kept low and they pay only for current actually used.

Westinghouse can help *you*, too—with skilled application engineering and industry's *most* complete arc-welding line.

Call your nearest Westinghouse Welding Distributor, or write Westinghouse Electric Corporation, Welding Division, P. O. Box 868, Pittsburgh 30, Pa. For helpful literature just send in the attached coupon.

J-21816

YOU CAN BE SURE...IF IT'S Westinghouse

EVERYTHING for Welding ANYTHING!

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- ☐ B-5622 Type HC Industrial A-C Welders
- ☐ B-5453 D-C Arc Welder Type RA

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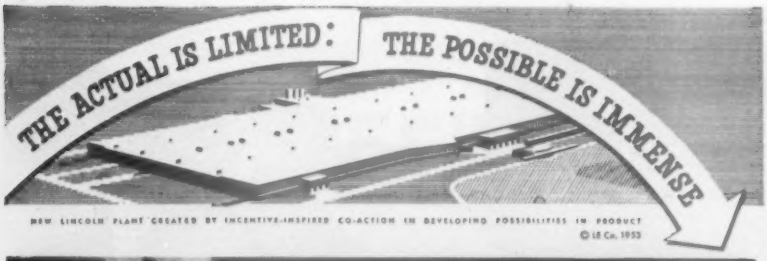


NEW LINCOLN PLANT CREATED BY INCENTIVE-INSPIRED CO-ACTION ON DEVELOPING POSSIBILITIES IN PRODUCT
© LE Co. 1953

DON'T BUY HARDSURFACING JUST BECAUSE IT'S HIGH PRICED

THERE'S a notion that a hardsurfacing electrode must be high priced to give proper service. This is not true and here's why:

By proper combination of alloy materials plus efficient, mass manufacturing, Lincoln hardsurfacing electrodes, costing one third as much money, produce equal and more often superior resistance to impact and abrasion.

1. Lincoln "Abrasoweld" sells for 25 cents a pound. This is only about one third the cost of other hardsurfacing electrodes.

2. Lincoln "Faceweld" sells for 60 to 70 cents a pound . . . comparable rods cost $2.60 a pound.

Remember, in spite of these low prices, *you still get high alloy content* in Lincoln hardsurfacing . . . top resistance to impact and abrasion, which means low end-of-service cost. So why pay the high prices?

MAKE YOUR OWN COMPARISON. Try a sample order of "Abrasoweld" and "Faceweld". Your own jobs will prove that hardsurfacing costs can be cut 30 to 50 per cent!

A Hardsurfacing Expert is available in every Lincoln District Office. Ask for him to help solve your problem.

SEND FOR NEW LINCOLN HARDSURFACING GUIDE
Gives latest data on selecting correct hardsurfacing.
Available by writing on your letterhead to Dept. 1709.

THE LINCOLN ELECTRIC COMPANY
CLEVELAND 17, OHIO

THE WORLD'S LARGEST MANUFACTURER OF ARC WELDING EQUIPMENT

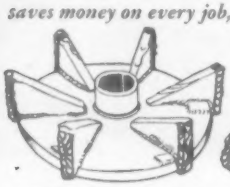
LINCOLN'S HARDSURFACING COST SAVERS

ONLY TWO RODS yet they solve 9 out of 10 hardsurfacing jobs

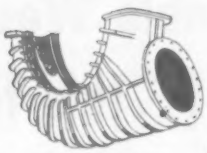
Lincoln "Abrasoweld" . . . a high carbon-chromium alloy for severe impact and abrasion.

Lincoln "Faceweld" . . . has chromium carbide crystals for severe abrasion and impact.

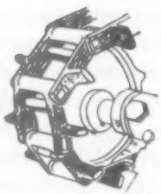
Simplify Your Inventory. Why stock a wide variety of hardsurfacing electrodes? Lincoln's unique "Abrasoweld-Faceweld" combination is ideal for 9 out of 10 hardsurfacing jobs . . . and *saves money on every job,* as for example:


SHREDDER VANES

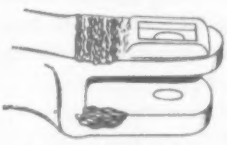
CROWFOOT


PUMP CASING

DIPPER TOOTH

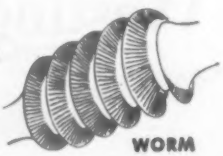

DRAG CHAIN

PUMP IMPELLER


DRAGLINE CLEVIS

SPROCKET

CUTTER HEAD


WORM

ESTABLISHED 1916

THE WELDING ENGINEER

SEPTEMBER, 1953

What Were We Fighting for?

THREE YEARS of warfare, over 140,000 casualties including more than 25,000 men killed, and an expenditure of $20,000,000,000. . . this was the boxscore at the time of the Korean truce. Perhaps the temporary truce will develop into a permanent peace and perhaps it won't; nothing is settled.

What were we fighting for? I wish somebody could explain it to me. All of the customary reasons for a war seem to have been absent. American shores were not threatened. The lives of American citizens were not in danger. There were none of what historians are fond of listing as "economic causes": the land is almost valueless as either a source of raw materials or as a market for manufactured goods. Neither were there valid military reasons. We needed no military, air or naval bases in Korea.

Then why did we enter this costly conflict? Here are some of the explanations I have heard:

To stop the advance of Communism. But Communism is as strongly entrenched as it ever was in that part of Asia. We never touched Russia, but we did make an implacable enemy of China.

To halt aggression. Yeah, how we halted it!

To preserve the United Nations. When one country supplies 90 to 95% of the fighting forces, how united are the United Nations? Some UN members did contribute token forces, but most of them just weren't interested.

SOME starry-eyed idealists say that since we have become a world power, we must learn to think as a world power. Does that mean that we must work toward our own destruction? I am reminded of a lesson from history.

In classical times, Athens ranked as a strong nation. She could easily hold her own against Sparta. She fought Sparta to a standstill. Then Athens began to think as a world power. She sent an expedition to Sicily, as hard to reach in the fifth century B.C. as Korea is for us today. That expedition was a disastrous failure, and Athens eventually had to pull down her walls as a token of her submission to Sparta.

Athens might have stayed in business for a few more centuries, if she hadn't kept thinking of herself as a world power and dismissed all considerations of logistics as irrelevant.

All these reasons cited for entering the Korean conflict seem strangely void of horse sense but at least are motivated by "noble" principles. Not so this one:

We had to go to war to keep our prosperity. The ghouls who say this are thinkers of the same type as the dopes who believe we must destroy surpluses in order to have plenty. Wilful destruction can lead only to poverty. War is wilful destruction and cannot result in prosperity. A mild dose can give the illusion of economic well being, like a few cocktails at a party, but what a headache it brings on the morning after!

ANOTHER thing that I will never understand is why, having gone into this war, we didn't go in to win it. Douglas MacArthur, when he was General of the Armies, was not permitted to bomb the bridges on the Yalu River across which flowed the hordes and military supplies of Red China. After the enemy had been halted in his tracks, Van Fleet was not allowed to launch a counteroffensive that might have driven the Reds all the way back to Manchuria.

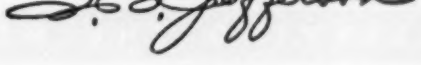
Who was it that laid down the rules that made winning in Korea impossible? And in the name of heaven why? I think that the American public has the right to be informed.

If we have lost our independence as a sovereign state and are now functioning only as the strong right arm of the United Nations, that important fact should not be hushed up. The men who are going to do the fighting have the right to know about it.

From this ghastly experience in Korea, there emerge these self-evident truths:

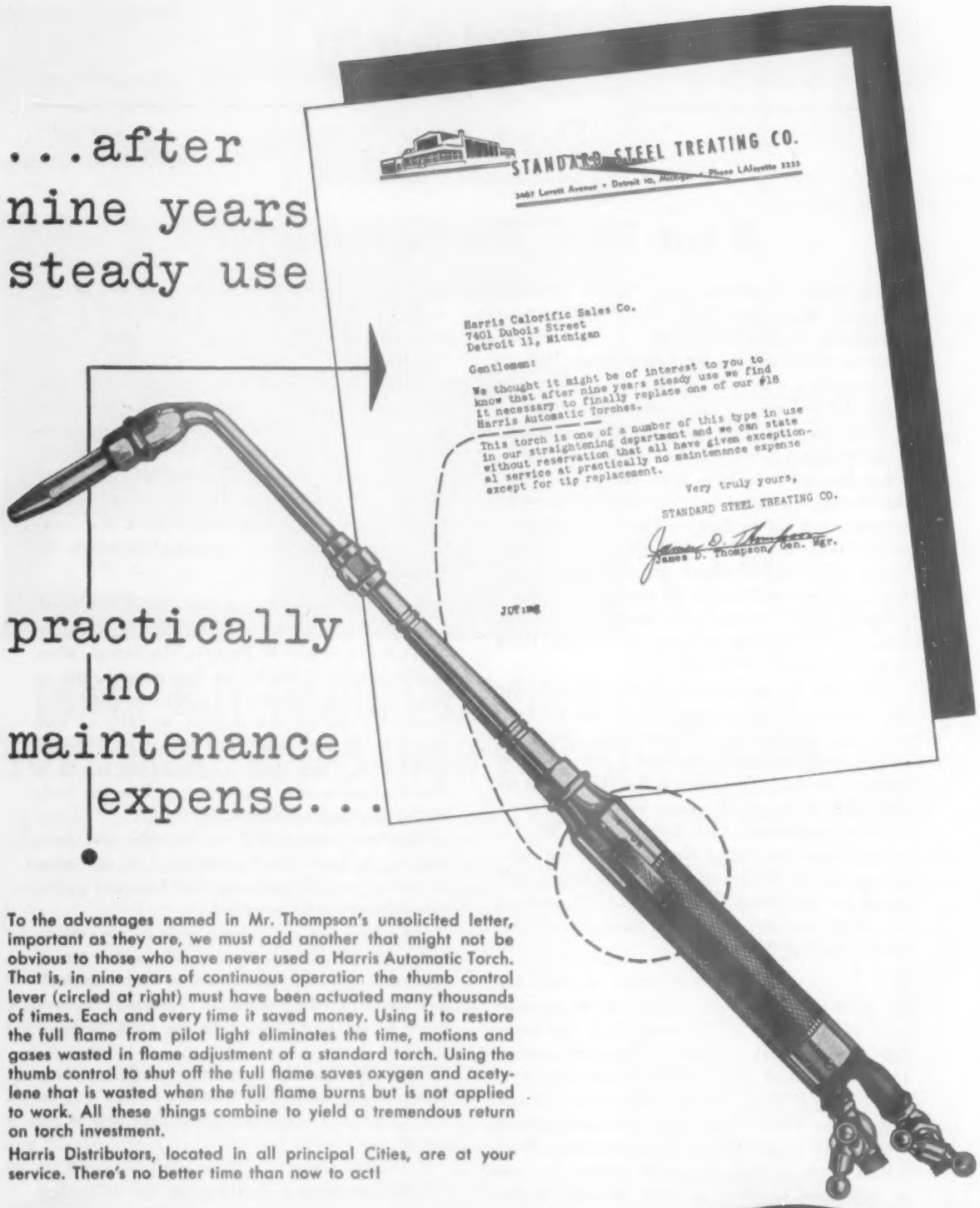
1. It is easier to get into a war than it is to get out of one.
2. It is the nature of a "little war" to expand.
3. We in America should go to war only when our own safety plainly requires it.

When these lessons are learned, if they ever are, then the Korean conflict may prove to have been worth what it cost us.



...after
nine years
steady use

practically
no
maintenance
expense...


STANDARD STEEL TREATING CO.
3467 Lovett Avenue • Detroit 10, Michigan • Phone LAfayette 2333
Harris Calorific Sales Co.
7401 Dubois Street
Detroit 11, Michigan
Gentlemen:
We thought it might be of interest to you to know that after nine years steady use we find it necessary to finally replace one of our #18 Harris Automatic Torches.
This torch is one of a number of this type in use in our straightening department and we can state without reservation that all have given exceptional service at practically no maintenance expense except for tip replacement.
Very truly yours,
STANDARD STEEL TREATING CO.
James D. Thompson, Gen. Mgr.
JDT:MS

To the advantages named in Mr. Thompson's unsolicited letter, important as they are, we must add another that might not be obvious to those who have never used a Harris Automatic Torch. That is, in nine years of continuous operation the thumb control lever (circled at right) must have been actuated many thousands of times. Each and every time it saved money. Using it to restore the full flame from pilot light eliminates the time, motions and gases wasted in flame adjustment of a standard torch. Using the thumb control to shut off the full flame saves oxygen and acetylene that is wasted when the full flame burns but is not applied to work. All these things combine to yield a tremendous return on torch investment.

Harris Distributors, located in all principal Cities, are at your service. There's no better time than now to act!

THE HARRIS CALORIFIC COMPANY

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SERVING THE METAL INDUSTRY SINCE 1905

Bascule Gates Welded for Horseshoe Dam *(see front cover)*

Three gates that weigh 125 tons each doubled storage capacity of this Arizona dam. Largest of their kind in the world, gates are of a design never before attempted.

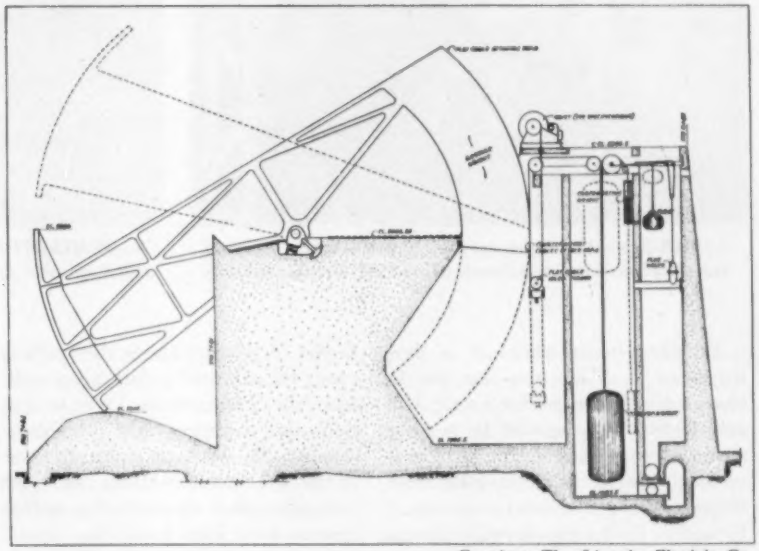
BY T. B. JEFFERSON

ARIZONA'S Horseshoe Dam structure should prove a long-enduring monument to the designers of large civil engineering projects. It is also a monument to the ingenuity of steel fabricators in adapting welding techniques to heavy steel construction.

Doubled Storage Capacity

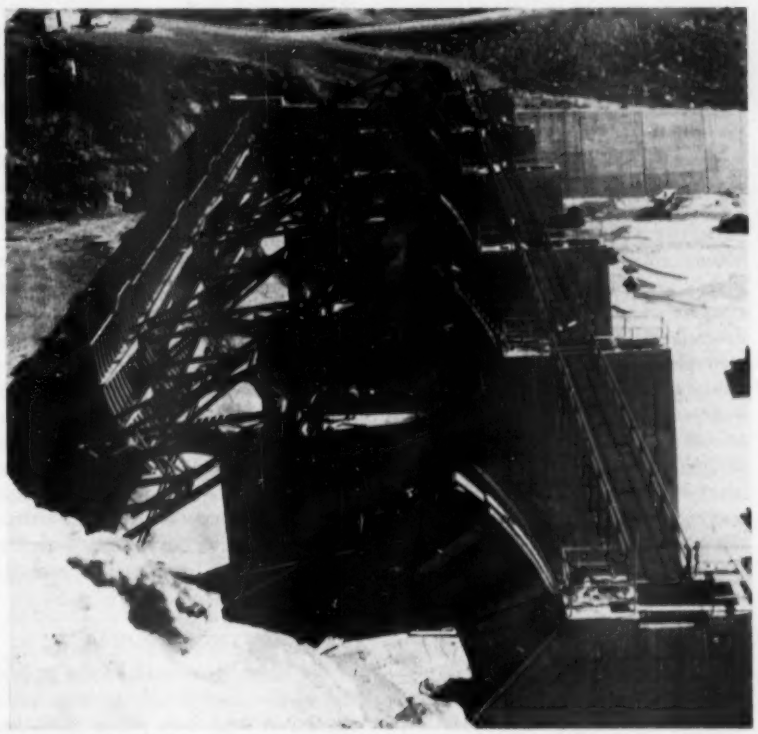
This giant dam is located on the Verde River about 55 miles northeast of Phoenix. Recently, welding was used to increase the water level of the Horseshoe reservoir by 26 ft—a move that more than doubled the storage capacity of the reservoir, increasing it from 67,000 to 142,000 acre-feet. The increase in reservoir capacity was accomplished by the installation of three huge radial gates on the dam spillway. The gates are of a design never before attempted and are said to be the largest of their kind in the world. Each of the three gates weighs 125 tons.

Horseshoe Dam is an earth-and-rock construction, built in 1944 by the Phelps Dodge Corp. for the Salt River Valley Water Users' Association. At the time the dam was built, the firm of Leeds, Hill and Jewett, of Los Angeles, the consulting engineers for Phelps Dodge, advanced the proposal to add radial flood gates to the spillway. Nothing was done about it then, but in 1949 the water users' association requested the Los Angeles engineering firm to go ahead with designs and also supervise the fabrication of the gates.



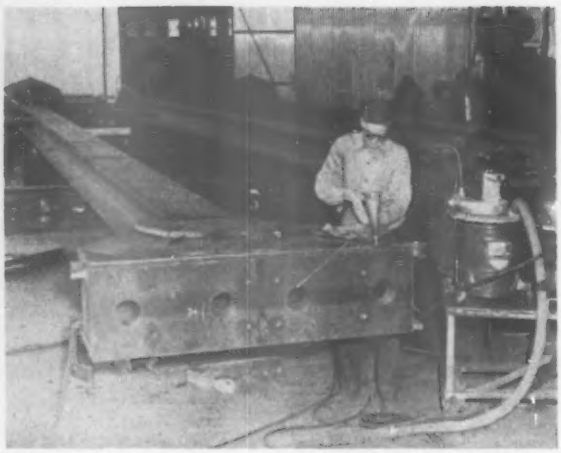
Courtesy The Lincoln Electric Co.

1—SKETCH of a cross-section through one of the piers shows the arrangement of the gate arm, bascule weight and hydraulic control mechanism



2—OVERALL view of gate installation gives you a good picture of the bascule mechanism. The gate skins were shop welded before field erection

3—FOUR anchor bolts on which gate arm is lowered are positioned on crosshead of welded anchor column



4—SEMIAUTOMATIC multiple-pass butt welds joined the 2-in. and 5-in. plates of anchor column crosshead

To give credit where it is due, Raymond A. Hill, who was put in charge of the designs for Leeds, Hill and Jewett, was the first to propose welded construction as the most economical method for the project. N. D. Witman, Jr., a structural engineer of Pasadena, Calif., was placed in charge of the development of the designs. The Allison Steel Manufacturing Co., Phoenix, was awarded the job of prime contractor to carry out the extensive welding operations.

How Gates Operate

The three gates are carried on counterweighted arms. The face of each gate is 114 ft wide and 26 ft high. Together, the three gates form a steel-faced dam 342 ft wide. Each gate can be lifted in a radial arc to permit the full discharge of flood waters. Since the gate is lifted completely out of the way, there is no danger of damage to its face by down-flowing debris. The gates are operated automatically by hydraulic mechanisms. In an emergency or for maintenance work, they may be controlled electrically. The general arrangement of the gate control mechanism is shown by Fig. 1. The counterweights and bascule mechanism of the gates may be seen in the view of the overall installation (Fig. 2).

The automatic control feature is especially noteworthy. Upstream from the gates is an intake tower that is connected by a 24-in. welded pipeline to six float chambers. The water level in the float chambers is kept the same as the lake level at all times. When the water level has risen to the 26-ft stage above the spillway crest, the six float valves open automatically. This permits water to flow into the counterweight chambers, causing the counterweights to rise. When the counterweights rise, the gates are raised automatically, as may be seen from Figs. 1 and 2.

One of the toughest welding jobs was completely hidden from view by the time the structure was completed. This was the assembly of the heavy-section steel anchor columns, which are embedded in the six concrete piers supporting the gates. It is the purpose of the massive anchor to take the compression component from the horizontal frame of the gates.

The anchor columns were built up from rolled structural steel sections; specifically, 14 by 16 in. wide-flange H-columns weighing 248 lb per ft. The H-column has 2-in. flanges, a 1¼-in. web and a cross-sectional area of 77.63 sq in.

The upper part of one of these anchors may be seen in Fig. 3. This picture shows the heavy, all-welded gate arm being lowered onto four anchor bolts. These bolts, positioned on the crosshead of the anchor column, provide a means of anchoring the gate bearing to the dam's structure. All but the upper part of the anchor column crosshead is embedded in the concrete.

Building the Crosshead

The heavy crosshead at the upper end of the anchor column was built up of 2-in. and 5-in. plates, with the addition of a number of 2-in. gusset plates for stiffening and reinforcing. Figure 4 shows the welding of the 2-in. and 5-in. plates. The four holes at the end of the crosshead will receive the previously mentioned anchor bolts to which the gate arm bearing is fastened.

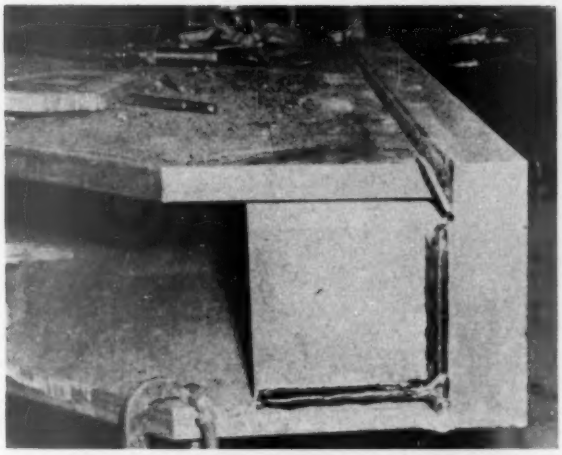
The design of the crosshead attachment is such that full development of the cross-sectional area of the column was necessary. Because of this, all the welds were specified as butt joints with a single-vee or double-vee groove. Semiautomatic submerged-arc equipment was used for the multipass build-up of the grooves. Slag was removed and weld metal peened after each pass.

Figure 5 shows the 5-in. top plate of the crosshead partially welded to the 2-in. plate. The design of the V-groove can be clearly seen in this picture.

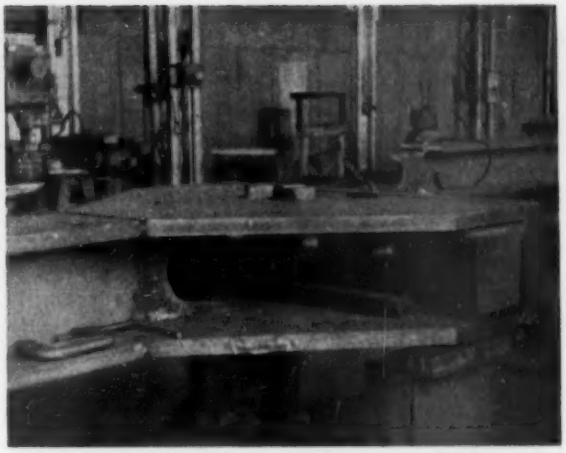
Because the flanges of the anchor column were 2 in. thick, 2 in. of weld metal had to be deposited in making the butt joint that attached the crosshead to the wide-flange H-column. Double-vee edge preparation was employed on this critical welding operation, pictured in Fig. 6.

Gamma-Ray Inspection

The soundness of these welds is extremely vital since the butt joint is in direct tension when the gates are in service. In view of this, it was specified that the welds should be inspected by gamma radiography. The contractor, sure of his weldors, did not feel 100% weld inspection was necessary. He was persuaded, however, to sign an agreement whereby he would pay the cost of inspec-



5—TOP plate (in vertical position) is now partially welded to upper end of crosshead. Note the V-groove



6—DOUBLE-VEE edge preparation was made for the butt welds that join crosshead to wide-flange H-column

tion should any weld imperfection be disclosed. Otherwise, the inspection cost would be paid by the specifying authorities.

The radioactive source was encased in an aluminum capsule, in turn sealed in a lead container during transportation. When a weld was examined, the aluminum capsule was removed from the lead housing and placed under the flange area to be examined. The time of exposure was varied according to the steel thickness.

The inspection work was done mainly at night or over a week-end. An area of the shop was roped off to avoid subjecting any personnel to injurious exposures. The radiographs were examined in duplicate by the laboratory technicians supervising the test. No evidence of porosity, slag inclusions or other discontinuities that would have necessitated chipping and rewelding could be found, so Allison Steel did not have to stand any cost of the weld inspection.

Gate Arms

Gate arms were built up from I-beam and H-column sections, with butt-welded joint connections. Force lines intersect at the hub of the assembly. Here the load is carried into a pin bearing, which is a spherical-cut roller bearing with OD of 23.62 in. for a shaft size of 14.168 in. Reaction from the shaft through the bearing is carried into a central cast-steel housing and from there is transferred in compression into the pier and in tension into the previously described anchor column.

The problem of fit-up and control of triangulation of the arm members prior to welding was not an easy one because of the inevitable shrinkage draw on the structural framework. Several methods and sequences of operations were tried before the best results (consistent with the least cost) were realized.

Commenting on this phase of the job, J. August Rau, vice-president and chief engineer of Allison Steel, recommended as the best procedure the laying out of the definite triangulation distances and the precision drilling of a sufficient number of holes and connecting plates so that all members could be pinned accurately into position and held to insure minimum shrinkage movement during the welding operations.

When completed, each gate arm weighed between 30 and 35 tons. It was hauled to the installation site with bearings, pins and central pin supports in place. Though this complicated haulage and installation, it permitted better alignment of the components than might have been possible with field assembly. Use of an overhead gantry facilitated spotting of the arm over the anchor bolts (see Fig. 3) and positioning of it accurately for attachment of the concrete counterweights.

Gate Frames

Each gate face framing and attached skin plate was made up in four sections. When these were assembled, they formed a rectangle about 26 ft high and 114 ft wide. The sections were wholly shop welded, including the structural girders that distribute the water load from the skin plate into the arms, the interconnecting radial ribs and the skin plate itself. Assembly was by means of butt welds, made by either fully automatic or semiautomatic submerged-arc welding equipment.

Radial curvature of the faces was required to be held within $\frac{1}{8}$ in. variance from a true arc in order to avoid binding when the gates come together, one to another, through rubber seals. (The gates may also be operated independently.) The trueing-up of weldments was a major undertaking since the only possibility of adjustment was through selection of the best welding sequence and by heating and shrinking the vertical radial ribs.

Another unusual application of welding on the job involved assembly of the radial beams that pass through the precast concrete counterweights. The beams were bent in the shop to predetermined curvature, and the counterweights were slipped over their ends and positioned one on top of the other. After the blocks were all in position and the arms attached, jacks were fitted to the ends of the beams. The beams were then prestressed and held tightly while the connecting head was placed in position. This made in effect a single, prestressed operating unit.

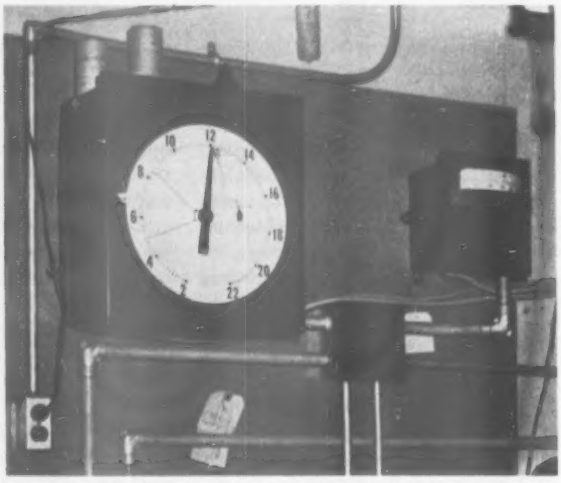
Access footwalks and stairs also were of welded construction, as well as trim items such as motor covers, handrails, lamp standards, etc. Altogether, this Horseshoe Dam project owes a great deal to welding.

1—BELL, buzzer and thermostat are the three assemblies to be brazed. Note the number of joints on each

2—THERMOSTAT housing components are held in jig while operator places tiny preformed rings at joints

Bell, Buzzer and Thermostat

The pictures tell the story. The production of these three warning devices for the U. S. Navy is accomplished in the easiest, most efficient manner by silver brazing them in an electric furnace.



5—TEMPERATURE and travel speed are set on master controls. Furnace temperature is usually over 1,200 F

By HERMAN C. PHELPS

EDWARDS & Co., Norwalk, Conn., makes bells, buzzers and thermostats for ships of the U. S. Navy plying oceans around the world. All three of these products are warning devices and have to be dependable. Edwards & Co. makes them waterproof also, though 100% waterproofing is not a Navy requirement.

The bells, the buzzers and the thermostats are all required to take a trip through an electric furnace. In one eight-hour shift, 1,500 of these three different assemblies are silver brazed together. Though the electric brazing furnace is only operated every other week, it has paid back its original investment many times over.

Three Assemblies—57 Joints

Let the seven pictures above tell the production story. Photo 1 shows the buzzer (17 brazed joints), the thermostat housing (22 brazed joints) and the bell (18 brazed joints). All of these joints are made in a single trip through the furnace. The tops and the bottoms of the three assemblies go through the furnace at the same time.

Some idea of the job of assembly can be gained by a study of photos 2 and 3. These depict the assembly of the thermostat housing, which with 22 brazed joints, is the most complicated of the three Navy warning devices. In photo 2, the man on the left is preplacing the tiny rings of silver alloy. These rings are preformed from 45% silver alloy having a melting point of 1,145 F. Most of the silver wire from which the rings are formed is of 1/32-in. diameter.

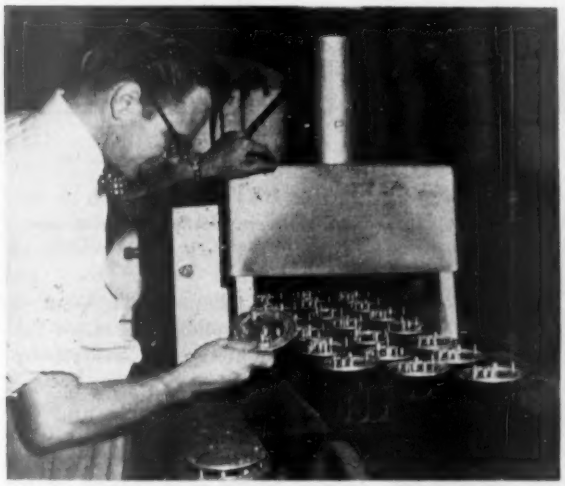
In photo 3, the operator is using pliers to push the brazing ring over the wire screen. Jigs are used to hold the assemblies in place during their trip through the furnace.

Flux in Hot Water

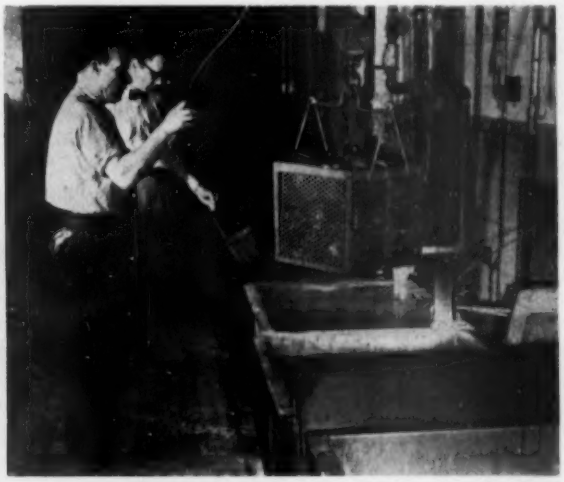
The procedure for assembly is to dip the covers into flux first. Next the

3—PLIERS are needed to push a ring of 45% silver alloy over the wire screen of the thermostat housing

4—ASSEMBLIES on the conveyor are about to enter furnace. The heating cycle requires around 40 minutes



6—SUPERVISOR inspects buzzer cover. Assemblies are water cooled before they come out of the furnace



7—BASKET holding brazed assemblies is lowered into various solutions to clean off and neutralize flux

parts are assembled, and silver alloy is placed at the joints. Then the flux is brushed onto the silver. Rejects of the brazed assemblies have been almost entirely eliminated by a simple production trick. The flux is kept at a temperature of 180 F. This is accomplished by keeping the flux jar in a container of hot water. An electric plate holds the water at the required temperature. At 180 F, the flux does not crystallize, and it also flows more easily onto the parts.

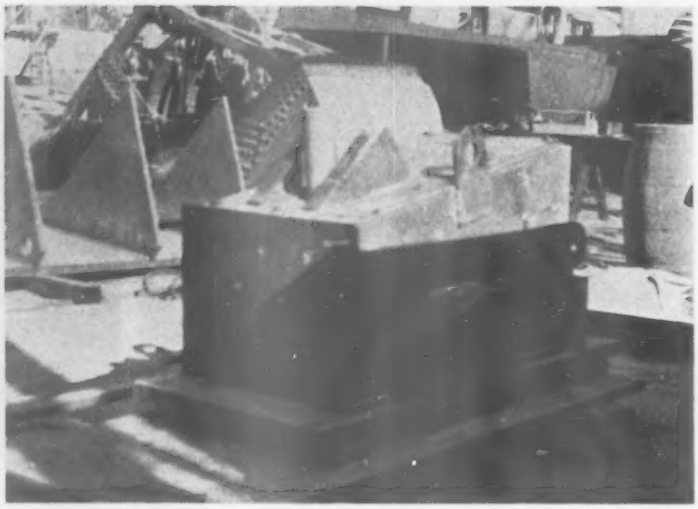
In photo 4, we see a group of assemblies on a conveyor about to start their trip through the furnace. Though the melting point of the brazing alloy is 1,145 F, the furnace temperature is usually held to slightly over 1,200 F (see dial in photo 5). The exact temperature will depend on the total amount of metal that is to be heated, which depends in turn upon the number of brazed assemblies that are making the particular furnace trip.

Treatment after Bbazing

In photo 6, we see a group of brazed assemblies coming out of the furnace. The supervisor is inspecting a cover with eight posts belonging to the buzzer. On this particular assembly, 1/16-in. silver wire is used on three posts touching a gasket. The heavier wire insured an ample flow of silver to braze the posts and the metal gasket at the same time.

All assemblies are water quenched before they come out of the furnace. This insures solidification of the brazing alloy and helps remove flux. The quenching is regulated to occur at the end of the heating cycle. As a final production step, the brazed parts are placed in a mesh basket and dipped into neutralizing solutions as pictured in photo 7. Several different solutions are used, their purpose being to clean off or neutralize the flux and prepare the assemblies for painting. The neutralizing solutions insure good paint bonding qualities and eliminate any possibility of flux corrosion.

1—TO MAKE a mold, the first step is to place the bottom board on steel plate



2—NOW wooden patterns are placed on the bottom board and dusted with parting sand. This is the pattern for one-half of sand mold

Wooden Patterns for

7—LIQUEFIED at a temperature of over 5,000 F, the weld metal flows around and between the sections of the roll. It takes less than a minute

BY E. RUSSELL

Ass't. to Supt. Mechanical Maintenance, Kaiser Steel Corp., Fontana, Calif.

THOSE big 29-in. "rolling pins" on structural rolling mills at our Fontana Works are amazingly expensive. The 1,500-lb rolls average $3,000 each, but it is not unusual for a single roll to cost $7,500.

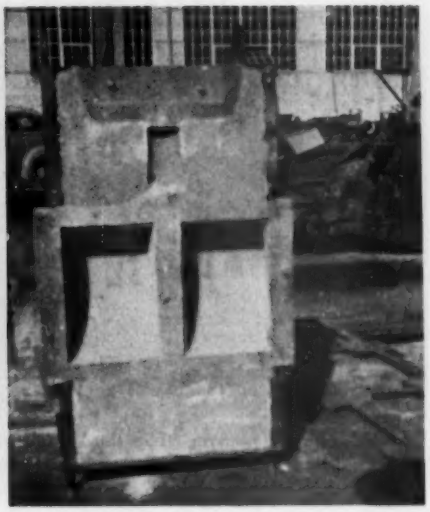
When the end of an otherwise perfectly good roll is twisted off by the torque applied by one of the 5,000-7,000 hp electric motors, there arises a wail of anguish, "Can't somebody do something about it?"

The Fontana Works of Kaiser Steel Corp. *is* doing something about it. We are using thermit welding to restore broken mill rolls to service —at a considerable saving in time and money.

Gets It in the Neck

The usual fracture is through the roll neck or journal, where the diameter narrows downs to 19 in. Power is transmitted to a roll by means of a tongue-and-groove connection. The cross-shaped tongue is on the end of the roll and is called the "wobbler." Under the terrific stresses created in the rolling of large steel, even a 19-in.-diameter section of tough alloy steel may twist off as cleanly as a

3—MOLD box half is positioned over the wooden pattern. Heating and pouring gate patterns are positioned. Box is filled with sand



4—MOLD is rolled up 90 degrees and gate and riser patterns are drawn out

Thermit Welding

piece of sugar candy. The roll, then, is useless unless a new wobbler can be welded onto it.

A good wobbler section usually can be obtained from a roll that has been scrapped for reasons other than wobbler damage. This eliminates the cost of forging and saves the time that would be required to shape the spades on the wobbler. The broken journal of the roll is machined off square and a 1½-in. hole is reamed in the center to align the roll journal with the wobbler. The all-important gap is left to receive the weld metal.

Our thermit is a mixture of finely divided aluminum and iron oxide with SAE 1040 steel. When this mixture is ignited, an exothermic reaction takes place. The terrific amount of chemical energy that is released creates a temperature of over 5,000 F, at which the weld metal is liquefied and flows around and between the two sections of the roll.

The actual welding is over in less than a minute. The preparatory work, however, is long and must be painstakingly done.

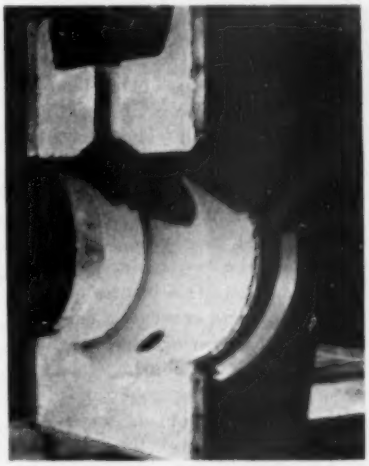
Through the coöperative efforts of our roll shop, maintenance machine and welding shop personnel and representatives of the thermit manufacturer, we have developed a wood-pattern method to replace the conventional wax-molding procedure. The use of wood patterns reduces the molding time by about one-third, eliminates two hours that would be required to melt out the wax and saves us the cost of 30 to 35 lb of molding wax.

The new mold box is a fabricated steel flask, designed with a vertical joint instead of the usual horizontal joint. It is also flared like a hopper on the sides, which saves two barrels of sand over what the flasks formerly required.

Making the Mold

A wood pattern the size of the roll journal is made, including the collar as an integral part of it. A wood core box for the pouring basin, a wood bottom board and tapered wooden pins to serve as pouring gate patterns complete the pattern equipment needed.

First, the bottom board is placed on a steel plate (photo 1). This board has a row of holes on either side for clamping the mold box to prevent it from slipping while the molding sand is being rammed in with a pneumatic rammer. The core pattern that forms the opening from the weld collar to the center of the pouring basin may be seen at the rear and center of the board in photo 1. This core serves as



5—FIRST mold half completed; all the patterns have been removed

6—THREE vertical pipes (foreground) support the end of wobbler

8—ROLL after pouring. The sand mold has been removed, but the risers and pouring gate are still attached. Note furnace built to preheat roll

a riser when pouring is being done. The upright end of the bottom board has two openings, through which the gate and riser pins are drawn out after each half of the mold has been rammed.

The patterns are placed on the bottom board (photo 2) and dusted with parting sand. Then the mold box half is positioned with the split joint down. A shim 1/16-in. thick is placed under its edges to allow a draw against the sand (total of ⅛ in.) when the two mold halves are bolted together. This insures a tightly closed joint and prevents a runout of metal during pouring. After the heating gate and the pouring gate have been positioned, the mold box is filled with sand and rammed. Excess sand is struck off the top, flush with the flask surface, and the flat cover plate is bolted in place (photo 3).

Patterns for the heating gate and the pouring gate are rapped sidewise to loosen them but are not drawn out at this time. Then the flask is lifted off the bottom board, care being taken to lift vertically. The journal and pouring basin patterns are designed to lift with the flask and stay in the mold. The mold is now rolled up 90 deg to a vertical position (photo 4). Gate and riser patterns are drawn out, and sharp corners are rounded off.

The journal pattern is rapped loose and carefully drawn from the sand. Should the sand flake off at the corners, the pattern is replaced for patching. Patching is done by moistening the sand along the break and filling in the damaged edges with sand, using a molder's trowel and slick. The pouring basin pattern is rapped and drawn last of all. Photo 5 shows the first half of the mold with all patterns removed.

This first mold half is lifted up by means of the lugs on the mold box and held by overhead crane while ¾-in. adjusting screws are inserted in the base. These serve as leveling screws as well as supporting legs for the mold to stand upon.

Furnace around Roll

Meanwhile, a furnace of loose firebrick has been built up around the roll body. Six to eight inches of air space are left around the roll for air circulation, and four openings are left on each side for the gas burners that preheat the roll prior to welding. The end that is to be welded is set flush with the outside of the furnace, leaving the journal protruding far enough to allow room for the mold box. The journal sits upon a steel plate. Loose fire brick and asbestos mortar are filled in around the journal so the heat will be sealed in the furnace. The furnace is covered with a flat steel plate, which is blocked up in order to allow an air space of 2 in. for air circulation around the top wall.

The wobbler end is inserted on the spacer pin, and three vertical lengths of pipe are tack welded to its end (photo 6). These three pipes support the weight of the wobbler and hold it in position during the pouring. The mold is carefully set down upon its leveling screws on the steel plate under the roll journal. After it has been adjusted for height, it is inched into place with a pinch bar. The leveling screws are adjusted as needed after each move until the mold is jammed tight against the roll neck, in line with the center of the 1¾-in. gap between the roll end and the wobbler.

The patterns are reassembled on the bottom board, and the second half of the mold box is rammed. The second half mold is nearly identical to the first except that instead of putting in a heating gate with a pouring gate, a heating gate and a riser are located in the mold. The second half of the mold may be seen on the left side of photo 6, as it is being slid into place.

After both halves of the mold are in place, they are drawn tight by bolts through the flanges of the box. Molding sand is rammed around the wobbler spades inside the collar, and a round disc of ⅛-in. sheet is tack welded over the end of the wobbler.

The roll body is warmed up slowly for 12 to 14 hours to take the chill out and is then preheated an additional 8 to 10 hours. The heating and pouring are done in the conventional manner. Ordinarily, 720 lb of SAE 1040 thermit are used. After pouring, the roll is cooled slowly for a period of from 19 to 20 hours, until the weld has had time to cool to a temperature below 200 F. At no time is the temperature of the roll body permitted to exceed 900 F.

Photo 7 shows the pouring operation for one of the largest thermit welds, which required 750 lb of thermit. Bill ("Smoky") Jacobs, of the forge and weld department, is shoveling sand over the molten slag. This weld saved a structural mill roll from the scrap heap by giving it a new wobbler. The repair was under the supervision of Burt Thorpe, foreman, forge and weld, and was performed by Bill Jacobs, boilermaker, Wiliam Root, boilermaker and John Botello, boilermaker helper, from sketches and designs by Ed Russell, assistant to the superintendent of mechanical maintenance.

Photo 8 shows the roll after pouring. The sand mold has been removed, but the two risers and the pouring gate are still attached. These were cut off close to the weld collar by oxyacetylene torch before the roll was sent to the machine shop. The collar was rough machined down to the journal size and then sent on to the roll shop, which redressed the journal by grinding.

A LOUD Bronx cheer came from a guy who had gotten a faceful of water from one of Old Ket's leakers

Kettlehead All Wet

The moral is: keep your eyes open and your mouth shut. There are other things that expand besides a braggart's chest, but they are usually more quiet about it.

BY CLEMENT HOWARD

SHIPS had been leaving the yard quite regularly. Then a bottleneck developed that slowed up the commissioning ceremonies no end. You'd never guess who was causing it. Well, maybe you would. It was no other than our old friend Kettlehead.

Kettlehead had transferred himself to another yard since our last account of him, but he was still the same old Kettlehead. This time he had put up a better front, though, and got himself hired as steamfitter weldor.

The steamfitters were in charge of the installation of the 5-in. fire main aboard ship. This piping was of copper-nickel and made with a 1/16-in. wall to withstand fairly high pressure. The fittings were of bronze and machined by the manufacturer to receive a preformed ring of brazing alloy. A copper-phosphorus alloy with 15% silver content was used.

Many of these fittings were quite heavy, especially the tees and elbows. Brazing them in position was quite a trick. For one thing, it required a special technique that the casual observer would never notice.

Old Ket was given the job of brazing these fittings. He didn't require any instructions, not he. He watched them being brazed for a while and proclaimed in his foghorn voice, "It's a lead-pipe cinch!" Nobody paid much attention to the bellow since Old Ket had already acquired the reputation of being "strictly for the birds" and was being given a wide berth by everybody but a few cronies who were in the habit of bending elbows with him at bars.

WELDOR PRIMA DONNA

Here is the way the job was handled:

The pipe was cut to proper lengths, and the ends were cleaned and fluxed. The bronze fittings were given the same treatment. Then the guys doing the installing would get the pipe all ready for Old Ket to braze into position aboard ship. As a final step, they would send a helper to tell him to come onstage.

Watching Kettlehead swagger up with his goggles, torch and paraphernalia was a sight worth seeing. He'd light up his torch with a flourish and braze up the fitting with a great deal of aplomb. Only trouble was he never could make a neat shoulder fillet.

When about half the system had been finished, the installation crew filled it with water and built up a pressure of 200 psi with a pump. That was quite a bit of pressure for such a large-volume system.

LEAKERS START UP

It wasn't long until everybody was screaming for Kettlehead to hurry up and repair a leak. While he was working at it, another leak sprang up, then another one and another. Ket was dragging his torch and hose fore and aft so much the safety guards were afraid that *it* would spring a leak.

Our boy was a plenty harassed weldor. His wind was bad from too much whiskey and cigarettes, and that alcoholic sweat was darned hard on his eyeballs. The raspberries gained momentum, and Ket began to get mad. Pretty soon he struck his neck way out on the chopping block.

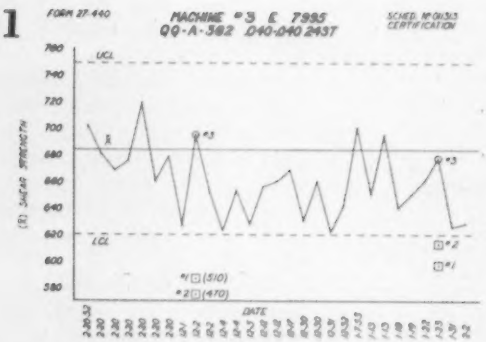
One particularly loud Bronx cheer came from a guy who had gotten a faceful of water from one of Ket's leakers. Ket lost his head and bellowed, "Those damn fittings can't be brazed leaktight with just that little insert." That remark was filed for future reference.

After he had repaired the leakers, the system was put under pressure again. Old Ket was standing there, bragging about what he thought was a good job of brazing, when this same fitting started giving off a fine spray. He got it right in the kisser.

Old Ket stalked off the ship and into the foreman's office to register a loud complaint. Half of the gang aboard ship followed Ket within earshot of the foreman's office, and everybody in the shop could hear him argue. He said, "Those (unprintable) fittings can't be brazed leaktight unless you add silver by hand." The foreman offered to bet $100 there was more than ample silver in the inserts. Ket was so mad he took the bet—mistake No. 2.

(Continued on page 51)

Figure 1



HOW THE quality-control charts signal the need for corrective or preventive maintenance at Consolidated Vultee is best told by citing some sample case histories.

CASE 1 (Fig. 1): Certification tests on Machine No. 3 established upper and lower control limits for production spot welding of 0.040 to 0.040 in. 24ST aluminum sheets. On December 2, the shear test average of the sample fell below the lower control limits by more than 50% of the span between minimum strength requirements and lower control limit. This value (labeled No. 1) is enclosed in a square in line with the December 2 date in Fig. 1. Acting upon the danger signal, we checked the machine and found it not set up to schedule.

Weld time and postheat were set at 52 milliseconds instead of 36 milliseconds, and a second sample was submitted (No. 2 enclosed in square for same date). The average did not pull up within the 50% condition. Knowing an assignable cause was present, we notified maintenance personnel after the second test. The maintenance crew replaced the upper electrode, cleaned contact points and then allowed the machine to fire continuously through the complete range of current settings for approximately two hours. A third test specimen (No. 3 in circle for the date of December 2) resulted in

Quality Control

A quality level predetermined upon the capability of each machine to produce upon a consistent basis is the goal at Convair. It isn't good enough to get spot welds just above the minimum strength requirements.

BY G. A. COVINGTON
Manager of Quality Control, Consolidated Vultee Aircraft Corp., San Diego, Calif.

RESISTANCE welding is a process saddled with an unusually large number of variables. Unfortunately, most of them are capable of seriously affecting the structural strength and metallurgical quality of the welded product. Despite vast improvements in welding machines, the need for quality-control measures in the production of resistance welds was never greater.

OUR WELDING SET-UP

Most of our resistance-welding operations at this writing involve the assembly of aluminum and magnesium components by the following means:

(a) Spot welding—the production of single spots, spaced at intervals greater than two weld diameters.

(b) Roll spot welding—the production of individual spots on a seam weld machine, the spaces between spots respectively exceeding two weld diameters.

(c) Seam welding—the production of spots spaced at intervals from two weld diameters to overlapping. Overlapping is the most common since seam welds are most frequently specified for fluid- or gas-tight joints.

Welds are designated as Class A joints if they must serve a critical or structural purpose and as Class B joints if they are for non-critical or non-structural assemblies. The total thickness of a Class B weld is never more than four times the thickness of the thinner outer layer of material. In Class A work, it is a rule (with few exceptions) that no more than two sections of material can be joined by a single weld.

Qualified production personnel are responsible for the control of machine settings, and records of current welding schedules are maintained at each machine for reference by the machine operator.

INSPECTOR makes shear tests of a spot-weld specimen on a machine in Convair's inspection test crib

Materials are cleaned in a more or less conventional manner prior to the production of all welds. If Class A work is required, this must be done within a period of 16 hours prior to actual welding operations. Materials for Class B welds may be cleaned as many as 72 hours prior to welding.

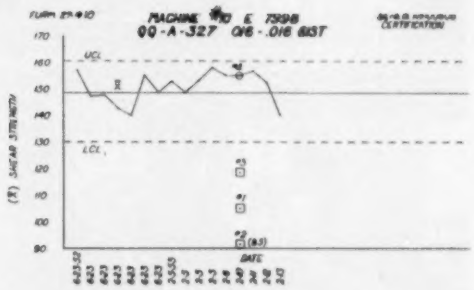
Cleaned materials are rubber-

an acceptable sample average within control limits.

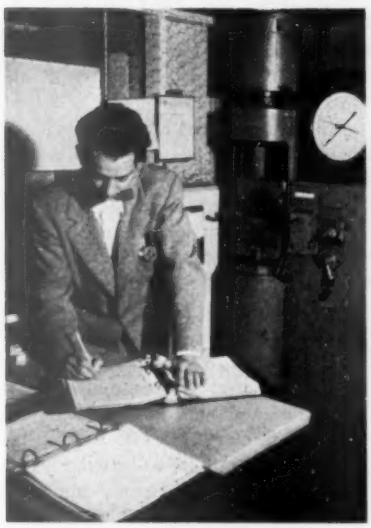
CASE 2 (Fig. 1): On January 23, the shear test average of the sample was within the 50% span between minimum strength requirements and the lower control limit. However, the operator was not satisfied with the low reading. The machine was checked, and it was found that the water tube was not full in the upper tip. After adjusting the water line, a third test was pulled with machine settings identical to the first and second tests. The third test resulted in the reading labeled No. 3 (for January 23) within the control limits.

CASE 3 (Fig. 2): On February 10, shear test values fell outside of established limits for machine No. 10. After shear test indicated by No. 1, the operator raised the heat adjustment the allowable 10%. Test specimen No. 2 was pulled and recorded. The value was still low. An investigation revealed that the water jacket was too close to the tip. To make doubly sure, the operator also replaced the upper electrode. Another test specimen resulted in the value labeled No. 3—better but still too low. Again, maintenance personnel were notified. They replaced a faulty timing tube, with results indicated by specimen No. 4.

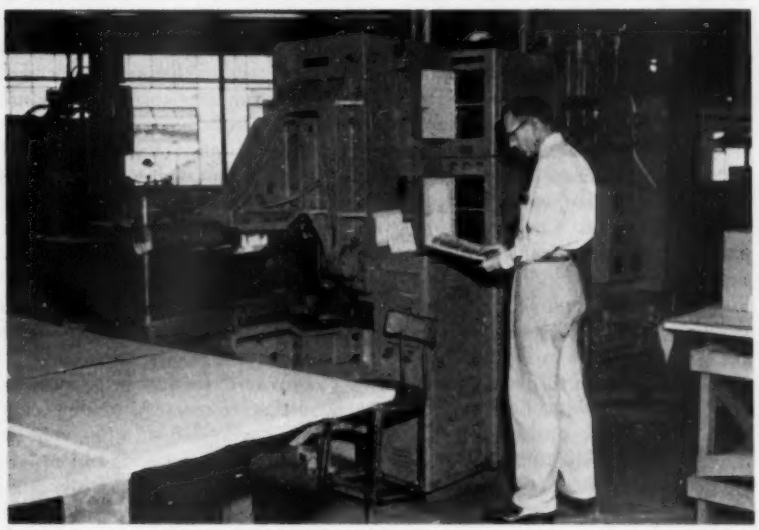
Figure 2



# of Resistance Welds



EMPLOYEE plots shear-test averages for spot-weld specimens on Statistical Quality Control Chart



WELDING engineer checks machine settings against the approved schedule

stamped with the date and time of cleaning. Each component must be recleaned if it is not welded within a specified period of time.

105 Welds per Specimen

Qualification tests are employed to assure the consistent operation of the welding machine over any desired operating range. For example, if a machine is to be used to produce spot or roll-spot welds, production personnel must weld two test specimens of the thinnest-to-thinnest and thickest-to-thickest alloy combinations that the machine is capable of handling. Each specimen must contain at least 105 consecutive welds. The specimens are cut into single-spot strips for testing.

Both 24S-T and 75S-T clad materials are used to qualify machines for welding aluminum alloys. If magnesium alloys are specified, test specimens may comprise QQ-M-54A or QQ-M-44A materials.

The same cleaning methods, machine settings and tip radii used in production are employed in preparing and welding qualification specimens. All test specimens are prepared so that they will represent, as closely as could be expected, typical production welds.

Of the 105 welds in a specimen, the tests run as follows:

EVERY spot welder at Convair makes at least 26 consecutive welds per test

Shear Tests: 100 single spots from each specimen. If any one weld fails to meet specifications, the welding method or equipment must be modified and the qualification test must be repeated. A variation of $\pm 12\frac{1}{2}\%$ is allowable in the shear strength of 90% of the specimens; remaining spots may vary as much as $\pm 25\%$.

Following shear tests, fractured production specimens are visually inspected for fusion and evidence of internal defects. Cracks, porosity, spits and cladding inclusions are all noted.

Macroscopic examination: The remaining five single spots from each set (specimen) are cross-sectioned as nearly as possible through their centers, then polished and etched. Aluminum welds are processed for 1 to 3 minutes in a fresh solution of Keller's etch. Magnesium welds are etched with a 10% citric acid solution.

Machines are qualified for seam welding by producing specimens with 20-in. continuous seams. These are longitudinally and transversely cross-sectioned for tests of the type indicated above.

Welding Schedules

Prior to production welding, schedules are established for each material or allowable combination of dissimilar materials and for each gage combination that can be welded by each qualified machine. Such schedules include details regarding the preparation of materials, the respective machine set-ups, control settings and any unique or unusual parts that may be welded.

The suitability of a schedule is demonstrated by making and testing at least 26 consecutive welds for each machine. Of these welds, 21 are tested in shear while the remainder are sectioned for macroscopic examination.

If three or more sheets are welded in combination, each outer sheet is tested in shear.

Special part number schedules are issued in the following circumstances:

(a) Where the gage combinations called for by the designs do not fall within qualification limits or meet joint thickness requirements.

(b) Where it has been demonstrated that satisfactory welding cannot be accomplished with routine schedules due to the design of a part or machine and tooling limitations.

(c) Where shop and/or shop and production inspection find a special schedule is essential to the production of a quality part or to meet minimum quality requirements.

Control limits are established by our statistical quality control group and are initially based on shear strength values obtained from qualification and certification data.

The quality control of spot welds in production involves the preparation of three-spot test specimens, which are tested in shear for each of the following conditions:

(1) Where a given production run lasts for more than one hour, a test specimen is produced at intervals not exceeding an hour by each machine engaged in the run.

(2) Where production runs are completed in periods of 60 minutes or less, a test specimen is produced each time there is a change in materials or gages of materials for a given machine.

(3) Where the control settings or electrodes of any given machine are changed or replaced, a test specimen is produced.

A macroscopic inspection of three consecutive spot welds is also made each time that materials or gages of materials are changed or at the end of each two hours of a long production run. This is done with each of Convair's resistance-welding machines.

When Tests Fail

If any specimen fails to meet the minimum requirements, the machine that produced the defective specimen is taken out of production. All welds made with the machine since acceptable specimens were produced are rejected, pending materials-review action. Before production with the machine can be resumed, 26 acceptable test specimens must be produced, using the materials and machine settings of the original certification. (When routine check tests indicate that adjustment of the control setting is necessary, all settings may be varied by $\pm 5\%$ from the established values or by 10% when only one setting is adjusted.)

Of the 26 test specimens, 21 are tested in shear; the remainder are sectioned and etched for macroscopic examination. Needless to say, if the machine cannot be adjusted to produce welds of the same quality it originally turned out, weld schedules are cancelled until the machine can be requalified.

If it becomes necessary to exceed the control limits of a given machine, two three-spot test specimens are produced and the machine is allowed to continue in production if the specimens meet the following requirements:

(a) The shear strength average must not exceed either upper or lower control limits by more than 50% of the difference or span between minimum strength requirements and the value established as the lower control limit by a statistical quality control graph.

(*b*) The shear strength range shall not exceed the upper control limit by more than the value established as the upper control limit plus the average range.

(*c*) The percentage of variation must not exceed 35%.

Rules for Seam Welds

All test data are recorded on graphs and retained by production inspection until the end of each month, after which the graphs are forwarded to our process control group for statistical analyses.

The production quality of seam-welded materials is controlled by mainly the same procedures that maintain the quality of spot-welded components. The exceptions are:

Two 2-in. welded joints or simulated sections of production joints are fabricated (1) hourly, (2) at the end of each short production run or (3) following a change in electrodes or control settings. One of these specimens is longitudinally cross-sectioned; the other is peel tested. The peel specimen is considered satisfactory if nuggets are pulled from the entire area of the joint.

Machine settings and tip contours are checked at least once every four hours to make sure the machines are being operated within permissible limits.

The tip or wheel contour of each machine is checked with an appropriate gage each time a production test specimen is produced.

Surface Resistance Check

Difficulties due to excessive surface resistance are avoided by checking samples of each batch of cleaned parts with a suitable test instrument. Corrective measures are taken where resistance is found to exceed 50 microhms. Our engineering test laboratory checks the test instrument for accuracy at least once every 30 days.

No effort is made to vary any of our quality control procedures in accordance with the class of welding. While the primary purpose of these procedures is to maintain high standards for Class A, we have found that it is better to produce Class B and tack welds of unnecessary quality than to allow operational discrepancies to remain undetected until Class A welds are required.

Each welding machine receives a routine check from Convair maintenance personnel at least once a month. During this check, the machine is reset to the values used in the original qualification test without adjustment. A tip pressure gage is used to adjust pressures to the exact values for the qualification tests and to perform a calibration check of the machine's pressure-indicating system. Then qualification test welds are produced as previously noted, and the test results are plotted on a graph (see Figures 1 and 2).

Things We Watch For

General rules observed by Convair personnel in the inspection of both test and production welds can be briefly summarized:

(*a*) The outer surfaces must be smooth and free of cracks, bulges, tip pick-up, pits or other defects that indicate welds made with dirty electrodes or improperly cleaned surfaces.

(*b*) Sheet separation is measured at a distance from the edge of the weld that is equal to half the weld diameter. It shall not exceed 0.004 in. in areas where aerodynamic considerations are requisite. In other cases, maximum sheet separation is not allowed to exceed 10% of the thickness of the sheet or 0.004 in., whichever is greater.

(*c*) The outline of the fusion zone in the etched sections of test welds must be substantially symmetrical and elliptical in shape if weld penetration and soundness are to be considered satisfactory.

(*d*) Internal weld defects (porosity, cracks, lack of fusion or voids) may be considered acceptable if they do not exceed: (1) 15% of the weld diameter, (2) 25% of the respective sheet thicknesses or (3) 15% of the diameter of the weld structure.

(*e*) Where aerodynamic considerations are essential, electrode indentations must not exceed 0.004 in. In other cases, indentations must not exceed 10% of the thickness of the sheet or 0.004 in.—whichever is greater.

(*f*) The extent of cladding into the nugget should not exceed 10% of the major weld diameter.

(*g*) Weld penetration into any outer sheet should be at least 20%, but not more than 80%, of the sheet thickness.

(*h*) The allowable number of visible external defects shall not exceed values specified for Class A and Class B welds.

KETTLEHEAD ALL WET

(Continued from page 47)

The foreman signaled for a fellow who was spending his evenings teaching a class in silver brazing at a vocational school. Call him Jack. Jack was asked to go out aboard ship and show Ket how it was done. By this time our boy had acquired quite an audience, and even more were in hiding.

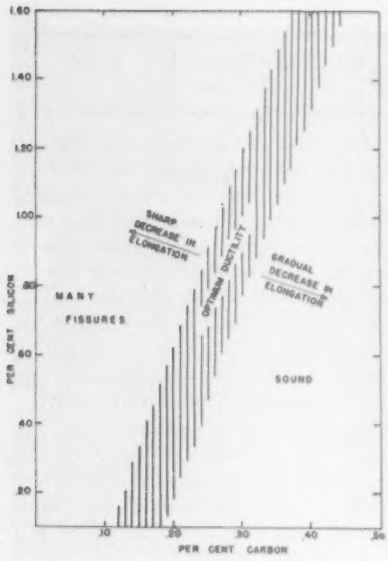
Jack took the same torch, tip and all, that Ket was using and started to heat a new pipe. Pipe and the fitting were all hooked up together ready to be brazed. Pretty soon the flux started to turn transparent on both of them. When he had transparent flux all around, Jack held his torch right behind the spot where the insert was and about eight inches away. He slowly brought the torch up real close until it was only half an inch away. Then—and here is the secret—he moved the torch over on the pipe for several seconds. After this procedure, he would hold the torch away for what seemed a minute or so and then apply the torch in this sequence: on the fitting, behind the insert, upon the pipe, off of both of them. About the third time he had followed this sequence, and while he was holding the torch away, lo and behold! The silver popped up and made the neatest fillet you ever saw. Because of the size of the fitting, only about two inches of fillet would be formed at one time.

Old Ket started to mutter, "I'll be an S. O. B. I'll be an S. O. B."

Jack continued to use the same technique all around the fitting, and he had the prettiest looking job you ever saw. Not once did he add any rod. The insert did it all.

Old Ket had seen a lot of fittings done in the same way, but he just hadn't noticed that the weldor was in the habit of taking the torch away. Perhaps he thought the guy was blind and couldn't see the silver solder. He didn't know the fellow had created a terrific expansion by heating the pipe *last*, and when he took the torch away he was only *waiting* for the silver to melt. If it didn't melt, of course, he started the sequence all over. When it did melt, it went both ways—to the end of the pipe and up and out on the shoulder to make that nice, neat fillet.

Who is so blind as he who will not see?



Courtesy Arcos Corp.

Carbon-Silicon Ratio

IMPORTANT relationship exists between the carbon and silicon contents of nickel-predominant alloys HT and HU. Optimum weld ductility is secured when the carbon and silicon in the weld metal fall within the shaded area of the chart above. Optimum balance between weld soundness and ductility is maintained if the silicon-to-carbon ratio is approximately 2 to 1—twice as much silicon as carbon.

Type HT castings are normally produced with silicon from 1.0 to 1.3% and carbon from 0.40 to 0.55%, which falls approximately within the 2:1 ratio. Weld metal should have about the same ranges.

At all levels of silicon, tensile strength of the alloy increases with increasing carbon. However, the level of carbon that will give the optimum elongation varies with the silicon level. Optimum elongation for weld metal with silicon below 0.60% is at a carbon level of about 0.20%.

With sufficiently high carbon, the weld is sound at any silicon level, but the elongation becomes lower and lower as the carbon increases beyond the minimum requirements (refer to shaded area of chart). With insufficient carbon, the welds contain many fissures and the elongation falls off sharply. The maximum ductility is achieved with about 0.20% carbon and 0.40% silicon. If high silicon (above 1%) is required, a weld metal with carbon below 0.25% will have low ductility and be prone to cracking. If the weld metal contains 0.40-0.50% carbon with 1% silicon, a sound deposit without fissures will result.

HT Repairing a foundry defect in a muffle assembly for a gas carburizing furnace. This is an HT casting: 35% nickel and 15% chromium

How to Weld the

Weld decay and carbon precipitation are terms that don't apply to heat-resistant chromium-nickel alloys. Odd as it may seem, you want high-carbon weld deposits.

BY **EARL M. ANGER,** *Chief Metallurgist, The Duraloy Co.*
WILLIAM E. DUNDON, *Foreman, Welding Dept., The Duriron Co.*
GARTH THOMPSON, *Vice-President, MISCO Fabricators, Inc.*

CAN you imagine a service temperature on the order of 2,000 F? Castings for, say, certain parts of a heat-treating furnace are required to take such temperatures in daily service. What sort of materials will stand up under such extreme conditions of high temperature and thermal shock?

The heat-resistant castings are made from a group of high alloys that contain substantial amounts of chromium and nickel, with other elements to render them suitable for their exacting duties. They are generally employed for service conditions where temperatures may range from 900 F to 2,200 F.

In previous articles (April and May issues of THE WELDING ENGINEER), the authors discussed the corrosion-resistant alloys—one of the two chief divisions of the high-alloy casting materials. The present article will consider the second major division—the heat-resistant alloys.

Like the corrosion-resistant alloys, the heat-resistant alloys are divided into straight-chromium and chromium-nickel groups. Both of these are designated by the Alloy Casting Institute with a term that begins with the letter "H." Thus the five grades of the straight-chromium group are: H-20M, HA, HB, HC and HD. The second letter of the Alloy Casting Institute designation refers to the amount of nickel, which increases as the letters travel down the alphabet. "B" represents a comparatively small amount of nickel; "D" a slightly larger amount, and so on.

Table I gives the nominal compositions of the straight-chromium alloys. Although the group is referred to as "straight-chromium," the alloys all contain nickel, in amounts varying up to 7%. The straight-chromium heat-resistant alloys are all ferritic in

ANNEALING covers are also of HT alloy. They were cast as separate sections, which were then arc welded together

Heat-Resistant Alloys

Table I. Straight-Chromium Nominal Compositions

Type	*Chromium, %*	*Nickel, %*	*Carbon, %*	*Other, %*
H-20M	9	1 max.	0.20 max.	1.25 Mo
HA	12	1 max.	0.25	
HB	20	2 max.	0.30	
HC	28	4 max.	0.50 max.	
HD	28	5	0.50 max.	

Table II. Chromium-Nickel Nominal Compositions

	Cr,%	*Ni,%*	*C,%*
Chromium-predominant			
HE	29	9	0.35
HF	20	10	0.30
HH	25	12	0.30
HI	28	15	0.35
HK	25	20	0.35
HL	30	20	0.40
Nickel-predominant			
HT	15	35	0.45
HU	19	39	0.45
HW	12	60	0.50
HX	17	67	0.50

metallurgical structure and are similar to the corresponding grades in the corrosion-resistant straight-chromium division previously discussed.*

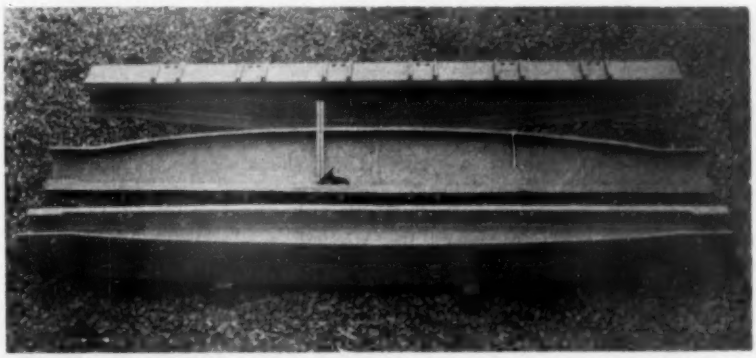
Tables III, IV and V on page 55 give heat-treating data, settings for arc welding and other useful information

Chromium-Nickel Alloys

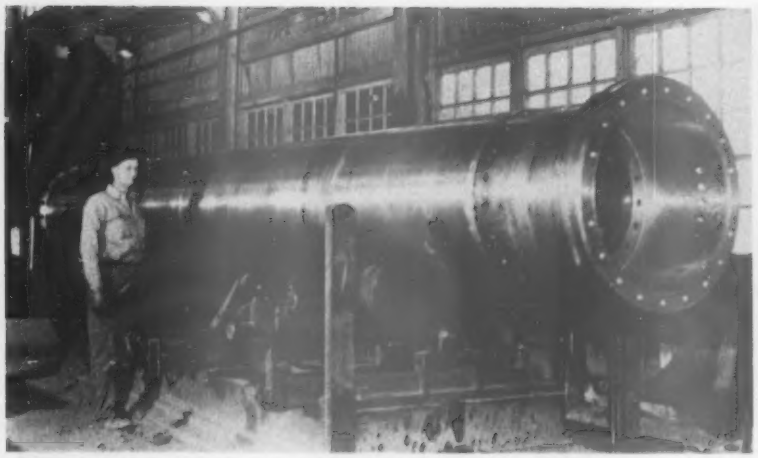
The chromium-nickel heat-resistant group is divided into two sub-groups: (1) chromium-predominant and (2) nickel-predominant. Chromium-predominant alloys include the compositions beginning with HE and continuing through HL (see Table II). These have a substantially austenitic structure as cast except for HE, which has a mixed austenitic and ferritic structure. The chromium-predominant alloys contain from 18 to 32% chromium and from 8 to 22% nickel.

The nickel-predominant subgroup comprises the high-nickel alloys from HT through HX. Nickel contents

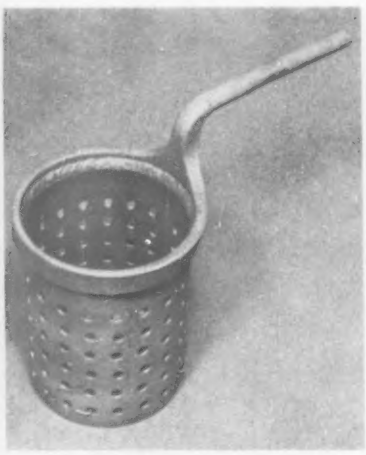
*The Welding Engineer, April, 1953, pp. 48-52.



HH Cast sections for support beam that must operate at 1,750 F in a heat-treating furnace. Alloy contains 25% chromium and 12% nickel



HK For casting the sections of above 27½-ft-long retort, an alloy of 25% chromium—20% nickel was used. Big tube weighs 12,500 lb



LADLE of same composition must withstand molten salt at 1,700 F

range from 33 to 68% and chromium contents range from 10 to 21% (see Table II).

Among the chromium-predominant alloys, the HH type is used in the greatest quantity and could be termed the "general purpose" grade. It is used for parts of heat-treating furnaces, oil refinery furnaces, power boilers, cement kilns and other applications where neutral or oxidizing atmospheres are encountered. The other alloys in the chromium-predominant series have similar characteristics and are used in corresponding applications, involving specific conditions of temperature, atmosphere and stress.

The most popular of all the alloys in the nickel-predominant subgroup of the chromium-nickel heat-resistant alloys is the HT grade. This has a content of 15% chromium, 35% nickel and 0.45% carbon. In addition, this alloy may contain up to a maximum of 2.50% silicon, 2.0% manganese and 0.04% phosphorus and sulphur.

Silicon-Carbon Ratio

Type HT alloy castings have found widespread use for such parts of heat-treating furnaces as rails, rolls, discs, chains, boxes, pots, fixtures and the like—parts that are subject to cyclic heating. With this grade and the related type HU—both important heat-resistant alloys—it is necessary to consider the silicon-carbon ratio. An interesting relationship has been found to exist between the percentages of carbon and silicon in the weld metal. With other alloys than HT and HU (except for rare uses of HK), the silicon-carbon ratio has not yet been found important.

Silicon is an element of great importance to the composition of the HT grade since it imparts heat resistance. The gist of the relationship that has been found to exist between the percentages of carbon and silicon in the weld metal is shown on the accompanying chart (page 52).

The carbon-silicon ratio gives us the clue to an important difference between alloy HT and the corrosion-resistant chromium-nickel alloys discussed in an earlier article.† With the corrosion-resistant alloys, low-carbon deposits are wanted to minimize carbide precipitation. With the HT and HU grades, high-carbon weld deposits are desirable to get the required heat resistance (determined by the amount of silicon).

Welding Characteristics

Straight-Chromium: Welding precautions and procedures for the straight-chromium group of heat-resistant alloys are similar to those for the ferritic corrosion-resistant alloys (types CB-30 and CC-50) discussed in an earlier article.* Preheat and postheat requirements for welding these alloys are given in Table III. These alloys are employed where resistance to corrosive action of hot gases is required, but where high strength at elevated temperatures is not of importance. They are usually arc welded, and all of the precautions mentioned for the corrosion-resistant straight-chromium materials must be employed. Alloy HC, with low-nickel content, has poor weldability. A preheat of 600-1,000 F and air cooling from 1,550 F after welding are both required.

Chromium-Nickel: As compared to the straight-chromium alloys, all of the chromium-nickel grades have good weldability by either arc or gas processes. In general, neither preheat nor postweld heat treatments are required. Although manual arc welding is the favored method, oxyacetylene welding is fairly common with the chromium-nickel alloys and is especially popular for the nickel-predominant subgroup, types HT, HU, HW and HX. Air-acetylene and oxyhydrogen flames are not used because of the lower flame temperatures and consequent slow rate of welding.

The thermal conductivity of the chromium-nickel alloys is only one-third that of plain steel. This means that heat will be retained in local areas for considerable time. Moreover, the thermal coefficient of expansion is about 50% greater than plain steel so that higher residual stresses and more warpage or distortion may be expected.

Electrical resistance of chromium-nickel castings is as much as six times the resistance of carbon steel, and the melting points of the alloys are one hundred or more degrees lower. The combination of greater resistance and lower melting point permits these alloys to be arc welded with lower currents than are used for welding carbon steels.

†The Welding Engineer, May, 1953, pp. 58-62.
*The Welding Engineer, April, 1953, pp. 48-52.

Processes and Techniques

Both arc and gas welding can be used to join the heat-resistant cast high alloys. Gas welding is a perfectly acceptable process for the heat-resistant grades because these alloys (unlike most of the corrosion-resistant alloys) contain relatively high percentages of carbon; therefore, no deleterious effects can result from carbon pick-up from the flame. However, gas welding does have several disadvantages.

The flame and its surrounding envelope of hot gases cannot be directed so that the heat will be concentrated in a restricted manner as in metal-arc welding. These hot gases will tend to play over a wider area along the weld joint. Also, the metal will be held at the temperature for a longer period than with the faster traveling, more concentrated arc.

The slower speed of gas welding causes the work to be held longer in the high temperature range than with metal-arc welding. This may result in excessive warpage because of the high expansion rate of these alloys.

Arc welding is used to a greater extent than gas welding. This process also has several disadvantages. Care must be taken to obtain penetration, and edge preparation is required on work greater than ⅛ in. thick. Nor do arc-welded joints resist exposure to high temperatures as well as gas-welded joints, particularly if a carburizing atmosphere is present in service.. Welds higher in carbon are usually obtained by gas welding. However, it is now possible to obtain welding electrodes capable of depositing high-carbon weld metal. For HT alloy, a special electrode achieves the same results as a carburizing flame, yielding weld metal of the following composition: carbon 0.40 to 0.55%; manganese 2.00% max.; silicon 0.75 to 1.50%; phosphorus and sulphur each 0.04% max.; nickel 34.0—37.0%; and chromium 14.5 to 16.5%.

Resistance-welding methods are also used to weld these alloys; in particular, flash welding to join tubular shapes.

Flames for Gas Welding

For the nickel-predominant alloys that are to be subjected to high temperatures, a carburizing flame rich in acetylene is recommended, especially if service conditions will in-

Table III. Preweld and Postweld Heat Treatments
(Straight-Chromium Grades)

Alloy	*Before Welding*	*After Welding*
H-20M	450-550 F	Heat to 1,200-1,300 F depending on original draw temperature, hold (*a*), then air cool.
HA	700-1,100 F (*b*)	Heat to original draw temperature, hold (*a*), then air cool.
HB	600-800 F	Heat to 1,450 F, hold (*a*), furnace cool to 1,100 F, then air cool.
HC	600-1,000 F (*c*)	Heat to 1,550 F, hold (*a*), then air cool.
HD	Usually not required	Usually not required, except for relief of welding stresses.

(*a*) Time at postheat treatment temperature should be sufficiently long to insure uniform heating throughout the area and section involved.

(*b*) After preheat, weld with severe peening of each bead.

(*c*) After preheat, weld with peening of each bead.

Table IV. Welding Rods and Electrodes

OXYACETYLENE WELDING

Alloy	*Rod Type*	*Flux Type*	*Flame Character*
*HH	309 bare	None	Slightly rich in acetylene
HI	309 bare	None	Slightly rich in acetylene
HK	310 bare	None	Medium rich in acetylene
HL	310 bare	None	Medium rich in acetylene
HT	330 bare	None	Very rich in acetylene
HU	330 bare	None	Very rich in acetylene
HW	Inconel	Stainless	
HX	Inconel	Stainless	

*Arc welding is preferred for the alloy grades HE and HF.

ARC WELDING

Alloy	*Electrode Type*	*Coating*	*Position*
HE	312	Lime	Any
HF	308	Lime	Any
HH	309	Lime	Downhand preferred
HI	309	Lime	Any
HK	310	Lime	Downhand preferred
HL	310	Lime	Any
HT	330-Spec.	Lime	Downhand preferred
HU	330-Spec.	Lime	Any
HW	65-15	Lime	Any
HX	Inconel	Lime	Any

Table V. Recommended Current Ranges
(Austenitic Chromium-Nickel Electrodes)

Joint Thickness, in.	*Electrode Size, in.*	*Current, Amps. Flat, Horizontal and Overhead*	*Vertical*	*Maximum Arc Voltage*
under ¼	3/64	15- 25	15- 25	23
	1/16	25- 40	25- 40	24
	5/64	35- 55	35- 55	24
	3/32	45- 70	45- 65	24
	⅛	70-120	70- 95	25
¼ to ½	5/32	100-140	100-125	26
½ to 1	3/16	130-180	130-145	27
over 1	¼	210-290		28
	5/16	250-400		29

clude a carburizing atmosphere. When carburizing or thermal shock conditions are not expected in service, then a neutral flame (or one only slightly carburizing) is recommended. Never use an oxidizing flame under any circumstances. If the weld metal becomes oxidized, porosity and excessive loss in chromium result, with generally unsatisfactory welds. The operator must watch the flame constantly to prevent an oxidizing atmosphere.

The carburizing flame ordinarily used is a long flame of the type usually described as "soft" because the harsh hissing sound characteristic of gas welding is not so pronounced. This type of flame is very rich in acetylene and deposits high-carbon weld metal. Another characteristic of this type of flame is a large outer cone with no clearly defined outline—this condition is commonly described as a "feather edge." Specifically for type HH, the excess acetylene feather should project a minimum of approximately ¼ in. beyond the tip of the inner cone. The flame for type HK is somewhat longer and so on up to approximately 1 in. for HT. In other words, the greater the nickel content, the longer the flame.

Torch tips for gas welding of heat-resistant alloys tend to be one or two sizes smaller than those used for welding plain-carbon steel of the same thickness. Maximum gas pressures are 10 psi for acetylene and 15 psi for oxygen. This is reduced at the torch when thin-section material is being welded.

Hold the torch in such a position that the tip of the small blue inner cone just touches the work and is inclined at an angle of about 30 deg from the vertical. Then point the tip down the joint in the direction the weld is being made. This insures a certain amount of preheat ahead of the puddle and tends to keep the heat off the deposited bead, allowing it to cool more rapidly.

Flux may or may not be required in gas welding, depending on the alloy being welded and the service for which it is intended (see Table IV). Commercial fluxes prepared especially for stainless steels may be used, but fluxes designed for braze welding are not suitable. Fluxes are generally mixed with water to a consistency of thin paste and allowed to dry after application. The heat fuses the flux, which flows over and protects the weld, giving a smooth, neat bead. Flux may be applied to the top and bottom of the joint and to the filler rod itself, but in many cases it is sufficient to apply it to the underside of the joint only.

Arc-Welding Requirements

In arc welding heat-resistant castings, use d-c reverse polarity (electrode positive) because it causes faster melting and therefore faster deposition of the filler metal from the rod. Reverse polarity also results in somewhat less heat input to the parent metal. The current should be as low as is possible to provide sufficient heat to insure good penetration.

While definite current and voltage cannot be given for all situations, Table V can serve as a rough guide for the chromium-nickel grades. For the straight-chromium grades HA through HD, the electrical settings, electrode sizes and types are about the same as for the straight-chromium corrosion-resistant grades (see April, 1953 issue, The Welding Engineer). For the H-20M alloy, a 9% Cr-1% Mo or a 12% Cr rod is used.

In welding heat-resistant castings, care should be exercised to avoid excessive voltage. Correct voltage is indicated if a slight withdrawal of the electrode breaks the arc. A short arc is preferable as it gives more uniform results and better control. A short arc makes it easier to direct the depositing metal where it is wanted. A good rule is to maintain an arc equal to the diameter of the rod. An excessively long arc tends to produce surface pinholes.

Electrodes larger than 3/16 in. are seldom used. Too large an electrode will create a large pool of molten metal, which is likely to develop shrinkage cracks on cooling. Short electrodes are preferred because the electrical resistance of heat-resistant alloys is so much greater than that of carbon steel. Long, slender electrodes should be avoided because they vibrate excessively and will make a steady arc difficult.

Cracks can result from excess exposure of the weld metal to the arc stream—by trying to make one pass do the work of two, weaving or puddling. All of these practices should be avoided.

For best all-around results, the heat-resistant grades should be welded in the flat or horizontal positions. A highly competent weldor can make satisfactory vertical or overhead welds, but it is advisable to avoid them if possible.

We have already mentioned the special electrode that is recommended for the HT and HU nickel-predominant grades. All the other grades can be readily welded with commercially available electrodes of corresponding analysis.

Tig or tungsten inert-gas welding is occasionally used on high-alloy castings. Straight-polarity d-c is preferred, and a filler rod may or may not be used, depending on the type of joint being welded. The Tig process has been found very good for light-gage material such as 1/16 and ⅛ in., where cast-to-wrought fabrications are involved.

Cast to Wrought Alloys

The difference between wrought and cast alloys has proved to be a source of trouble for many years. Type HT cast alloy has the same nominal nickel-chromium composition as type 330 wrought stainless, that is 35% nickel and 15% chromium, but the heat-resistant properties are entirely different. The wrought 330 material of conventional analysis is not suitable for high-temperature service involving carburization because its silicon content is too low and it has not been heat treated for such service. No such difficulties have been encountered with the other heat-resistant alloys.

Recently, two new products have been developed: (1) a rolled 35-15 alloy (330 and HT) that contains about 1.25% silicon and a maximum of 0.20% carbon and (2) a welding rod that will give a deposit of about 0.55% carbon with 1.25% silicon to maintain the required carbon-silicon ratio. By using these products, it is possible to weld together cast and rolled sections to produce fabricated structures suitable for high-temperature and thermal-shock service.

Many advantageous designs can be conceived by welding rolled and other wrought forms to cast shapes and forms. In joining such material, however, precautions should be taken to see that the wrought alloys are of similar analysis to the castings.

The decision as to whether to cast an intricate structure entirely in one piece or to weld separate castings is usually reached on the basis of the ease of casting, not necessarily on the

(Continued on page 69)

1—PREHEATING torch and bed of charcoal placed under wheel

2—ELECTRODE wire was 1/16-in. deoxidized copper. Helper slowly turned the big wheel with a crowbar so all welding could be done in flat position

Copper Wheel Gets a Build-up

A SOLID copper wheel 4 ft 4 in. in diameter had developed small cracks in its grooved channel. As a result, the wheel could no longer properly perform its job of extruding aluminum. Since this wheel had originally been made in Italy, replacement posed considerable of a problem.

The wheel is the property of the Anaconda Copper Co. and was in service at the company's Hastings, N. Y., plant. It is 4¾ in. wide and has a groove 1¼ in. wide by 1 3/16 in. deep. It was decided to repair the wheel by building up the groove flush and then machining it down again to dimensions.

Clean, dense deposits are particularly essential for copper build-up on areas that require machining to specified dimensions.

JOB FOR MIG WELDING

The job was given to the Guaranteed Welding Engineering Co., Clifton, N. J. The Mig (metal inert-gas) welding process, using 1/16-in. deoxidized copper wire, was selected after sample weld deposits on solid copper had been made and tested.

PREHEATED WITH PROPANE

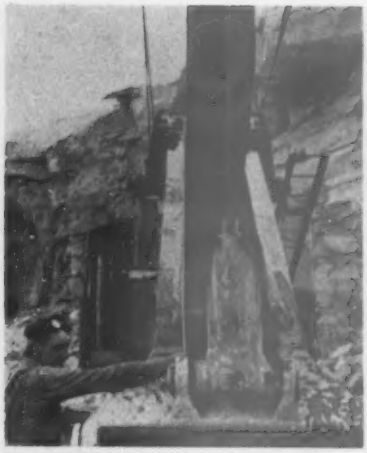
First the wheel was mounted so that it was free to rotate. A bed of charcoal was placed beneath it while preheating and welding went on. The preheating was done at 600 F with a large torch and a propane heating tip. Oxygen pressure was 50 psi and propane pressure 15 psi. The preheating torch was placed in a fixed position on the floor (photo 1), and the wheel was rotated intermittently so that the flames could heat the groove progressively. After withdrawal of the torch, pieces of charcoal placed along the inside of the wheel helped the charcoal bed to sustain the heat during welding.

A welding gun with a water-cooled nozzle and automatic wire feed was used. The shielding gas was a mixture of helium (35 cfh) argon (10 cfh). The operator employed a weaving technique. Wire feed speed was 190 ipm and current 370 amp. A helper slowly turned the wheel with a crowbar (photo 2) to give the welder the opportunity to make all the deposits in the flat position. A close-up of the welding operation appears in photo 3.

3—HERE we see the metal-inert-gas welding from a point close up

Layer upon layer of beads were deposited in this manner. Altogether, seven complete rotations of the wheel —and approximately 175 lb of copper wire—were required to build the groove flush to the top. Sound, dense metal was deposited, suitable for the necessary machining.

Photos courtesy of Air Reduction Sales Co.

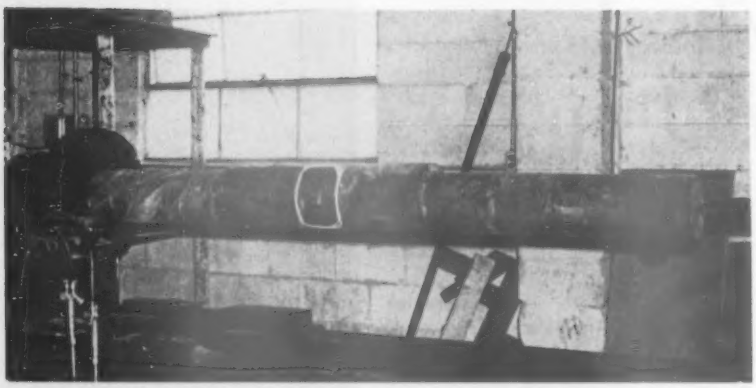


1—OPERATOR has stretched line to determine the extent of bend on the dipper stick for a shovel

2—CHALKED OUT area indicates where heat will be applied to straighten the dipper stick above

3—TWO MEN, two torches heat the marked-out section. Note the V-shape of the area being heated

Torch Maintenance



6—PITTMAN shaft of large crusher is to be flame-straightened by the method used for dipper sticks. Note the large area chalked out for heating

7—ANOTHER big straightening job had to be done on the connecting rod (an I-beam) that transmits reciprocating motion to this granite gang saw

BY J. DEAN DAVIDSON*

Member of Maintenance Crew, Davidson Granite Co., Lithonia, Georgia

THE DAVIDSON Granite Co. produces both building and crushed stone. Therefore, our operations embrace those problems common to both the crushed stone and the dimension-stone industry. As would be expected, the type of operations and processing equipment are not all similar. Crushed stone production requires the maintenance of electric and Diesel shovels, crushers and screening equipment, while the dimension-stone work requires that gang saws and other shaping and finishing equipment be kept in first-class operating condition.

Most of our more common oxyacetylene maintenance jobs can be classified under the following three headings: (1) Heavy heating with the oxyacetylene flame, (2) oxyacetylene welding and (3) those jobs in which the oxygen cutting processes are involved.

HEAVY HEATING

Northwest Type 80D 2½-yard capacity shovels are used on the floor of the quarry for loading. These shovels are subjected to very heavy

*Abstract of a paper given at the annual meeting of the International Acetylene Association, Atlanta, Ga., April 13-15, 1953.

4—AFTER local area has been brought up to a red heat, it is allowed to cool normally in air

5—HERE is the dipper stick as good as new. The straightening took two men three hours. This time can be fitted in whenever shovel is idle

for a Quarry

service, particularly in sweeping the quarry floor at the edge of the muck pile. In this sweeping operation, there is tremendous lateral stress on the two dipper sticks that support the dipper. As a result, these dipper sticks become bent, even though they are fabricated of 1-in. plate. The bent "sticks," which are in reality box beams measuring 6 by 12 in., are straightened right in place.

Photo 1 shows the start of the operation in straightening the dipper sticks. The operator has stretched a line to determine the extent and point at which the sticks are bent. Bow in these dipper sticks results in loose motion, making accurate control of the dipper or bucket impossible and resulting in lower shovel efficiency.

In photo 2, the operator has picked out the point of the bend from the cord stretched in the previous picture and has chalked out the point at which heat will be applied. This marked area is in the form of a V with its apex on the inner side of the top and bottom of the beam. We have found that heating an area the size of that marked in this picture will straighten the beam ½ in. If less than this bend is required, we reduce the size of the section to be heated proportionately. If more bend is necessary, we mark off additional vees and heat them as required.

Two operators are heating the marked-out section in photo 3. The V-shape of the heated area can easily be seen. Both men are using heavy multiflame heating heads with a number of small flames on each heating tip instead of a single large flame. Notice that the long side of the heated area is toward the outside of the bend. The inside surface of the beam is not heated at all.

This method of straightening does not depend on jacks nor physical force to straighten the member but upon the contraction of the metal after heating. The long side of the V-shaped area, being towards the outside of the bend, contracts more than the apex side and consequently the outer or convex side of the stick is shortened when cooling is complete. After the heated section has cooled, the operator rechecks the stick with piano wire or a cord stretched tight. If the stick is still bent, he repeats the procedure at the needed point. One, two or even three heats may be required to straighten a very badly bent stick.

The average time required to bring the section outlined in chalk to a red heat is 6 to 8 minutes, after which the beam is allowed to cool normally in air (photo 4). It is important to use relatively large heating heads to bring up the temperature of the

8—ZINC being poured into the mantle for 36-in. gyratory crusher. Torches heat the mantle prior to "zincing" to avoid porosity

9—BENDING an eye on a large piece of shafting. Torch heat enables the job to be done before the forge could even be lighted

10—BRAZE welding a crack in the water-cooled cap of the Pittman shaft for crusher pictured in photo 6

11—ANOTHER repair by braze welding. This heavy bearing goes on the bottom end of an eccentric shaft

chalk-marked areas quickly before appreciable amounts of heat can spread to adjacent parts of the beam.

The section where the stick was bent and heat applied can be seen in photo 5. The total time on the average job for the straightening of both sticks is approximately 3 hours for two men. This time can be fitted in easily whenever a shovel is idle since no dismantling is required. This straightening procedure is a standard operation in our quarry.

A flame-shrinking job of a different and heavier type is done on the eccentric or Pittman shaft of a 24 by 36 in. jaw crusher. This shaft is 13 in. in diameter, approximately 10 ft long and weighs 1¼ tons. It becomes bent under heavy crushing conditions and must either be straightened or replaced.

First step in straightening is to put the shaft in a lathe and mark out the point of bend. An idea of the size of the shaft can be obtained from photo 6. In this picture, the point of bend has been determined and the area to be heated has been marked. The shaft is bent about ⅜ in. and will require three heats of the area shown for straightening. Again, two heavy multiflame heating torches are used. It takes approximately 15 minutes to bring the area marked to a dull-red heat (1,500 F).

We have found that it is best to heat and then allow plenty of time for the shaft to cool naturally. Standard practice is to heat once a day, although when rushed, we have made heats every four hours. Three heats straightened this shaft to within twenty thousandths, which was within the required tolerances.

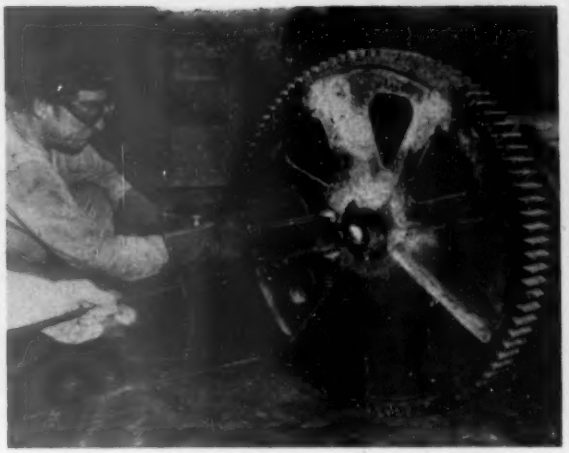
Photo 7 shows a block of stone that is being cut by the quarry tool called a granite gang saw. In producing dimension stone, the granite is removed from the quarry in blocks approximately 6 by 6 by 14 ft, and the gang saw cuts this block into finish slabs. Not only is the gang saw equipped with blades, but hardened steel shot is poured into the slot or kerf to facilitate the cutting action. Average sawing time on such a block is 12 hours. The reciprocating or sawing motion is transmitted to the saw blade cradle or frame by a connecting or Pittman rod, which is in reality a heavy I-beam. This beam, measuring 15 by 8 in., had bent approximately 3 in. out of line. The problem was to straighten it.

We used the same V-shaped heats as described for dipper sticks. The Pittman rod was straightened in a few hours, using three heats.

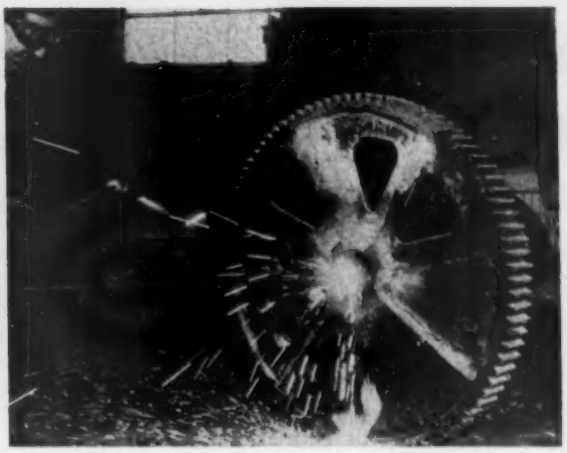
In addition to flame-shrinking, heavy heating is employed for a number of jobs. The mantle for a 36-in. gyratory crusher is heated preparatory to "zincing" the mantle to the bell in order to remove the moisture and gases that would cause porosity. Photo 8 shows the zinc being poured. The previous heating has removed any danger of zinc "spatter" from moisture and assures a solid job.

In photo 9, operators are bending

12—TRIMMING a churn drill bit. These bits are used to drill holes 60 ft deep and 6⅝ in. in diameter, as required for primary blasting



13—REMOVING a "frozen" shaft. First a small spot on shaft is brought to red heat for the oxygen lance



14—AFTER hole had been lanced through its center, the shaft was allowed to cool, and it came out easily

an "eye" on a piece of shafting for a breakdown job. On breakdown work, we have found oxyacetylene heating invaluable for shortening the downtime. The operators will have this eye shaped and back on the job before the forge could be lighted.

A portable hydraulic power press is rigged to press out the shaft from the drive sprocket of a Northwest 80D shovel. Sometimes the job is too heavy for a portable press. Then the quick heat of the oxyacetylene flame expands the hub of the sprocket wheel before heat can soak into the shaft, and the shaft is easily pressed out.

Jobs for Braze Welding

Oxyacetylene braze welding also plays its part in our maintenance operations. By means of this process for maintenance and repair, we are able to keep our stock of spare parts to the minimum and still operate without downtime waiting for spare parts.

Photo 10 shows an operator braze welding a crack in a Pittman cap. These water-cooled caps fit on the large eccentric shaft shown in photo 6. When the jackets cracks, the cap must be braze welded before rebabbitting. First, however, the oxyacetylene gouging process provides a fast, easy way to vee out the cracks both outside and inside. After braze welding the cap, the jacket is tested at 65 psi water pressure.

On the bottom end of the eccentric shaft, a heavy bearing known as an eccentric bearing gives the bell crushing action. Photo 11 shows an operator braze welding a cracked eccentric housing.

Cutting Processes

The oxyacetylene cutting processes also play their part in the maintenance work required to keep our quarry running smoothly. Photo 12 shows an operator trimming a churn drill bit. These bits are used to drill the 60-ft-deep, 6⅝-in.-diameter holes that are required for our primary blasting. The inner courses or muck passages of the bits gradually close under repeated sharpening. The courses shown here are being trimmed to proper contour and depth.

These bits are screwed onto heavy drill stems, which are subject to cracking and breakage at the point just above the bit under the constant abuse of drilling. A standard practice in our maintenance department is to arc weld on a new box joint end. The stem is prepared by oxyacetylene cutting. The operator takes two cuts to bring the stem end to a chisel point. After both sides have been beveled in a similar fashion, the welding is done and then the stem put into spare parts stock.

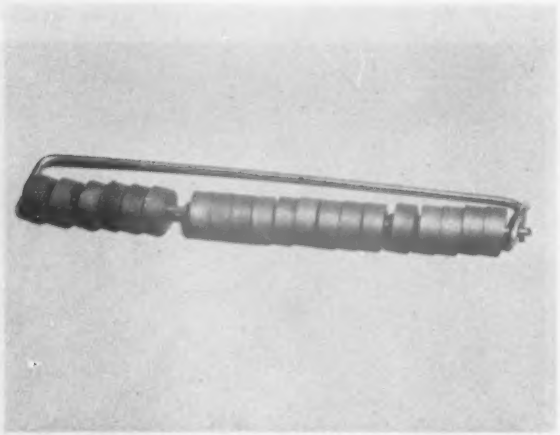
The liners used on the machines that sack poultry grit are subjected to extreme abrasive wear and require periodic replacement. The fabrication of these liners in our own shops, has resulted in substantial economies in the maintenance of the sacking machines. The liners are cut to approximate size with the oxyacetylene flame. Because of the close tolerances required, they are then stacked and swung in a lathe to be machined to final dimensions.

As a final illustration of how we use oxyacetylene cutting processes in our maintenance, a shaft had "frozen" in the spudding gear from a 27-T Bucyrus Erie well drill. This shaft had resisted all efforts to remove it with a hydraulic press and oxyacetylene heating. Then we decided to try the oxygen lance. In photo 13, the operator is using a cutting torch to bring the end of the lance pipe and a small spot on the shaft to a red heat. The lance itself consisted of a length of ⅜-in. steel pipe, hooked up to an oxygen regulator with a length of of standard ⅜-in. oxygen hose. A valve on the inlet end of the pipe controlled oxygen flow.

The lance operator slowly opened the oxygen lance valve, and the oxygen stream bored a hole through the center of the shaft as the lance pipe was advanced (photo 14). Some of the lance pipe was consumed in the operation. After the hole had been lanced through the length of the shaft, the shaft was easily removed.

This method eliminated the danger of damaging the bore or keyway on the gear proper. The entire operation took only a few minutes.

This is by no means the whole story of the oxyacetylene operations performed by our maintenance department. However, the pictures do give some idea of the variety of jobs handled in quarry maintenance.



1—MAN-SIZE safety pin is 6 inches long and holds about 24 inserts of tungsten carbide for wet blasting

2—BLASTING compartment. Note operator's hands at left and the three wires of inserts on mesh flooring

Wet Blasting for Silver Brazing

Problem of scale removal from parts that are to undergo brazing is one frequently encountered. The wet blasting method has met with a high degree of success.

3—ARMHOLES in cabinet allow operator to handle the abrasive gun

WET BLASTING consists of hurling water-suspended abrasives at high velocity upon the work by means of compressed air. It is not only a rapid cleaning process, but, since fine-mesh abrasives are used, it is possible to maintain close tolerances on critical sections. Abrasives range from 80 to 2,500 mesh, permitting tolerances as close as 0.0001 in. where required. The fine-mesh abrasives also avoid the breakdown of sharp edges, corners or other normally vulnerable areas.

Wet blasting was indicated in the manufacture of water-spraying nozzles made by Spraying Systems, Inc., of Bellwood, Ill. Tungsten-carbide inserts were being silver brazed to stainless-steel caps. The tungsten carbide had to be perfectly free of scale prior to brazing, or the silver alloy would not flow properly and the bond would be poor. The inserts were supposed to be descaled before they arrived at the Bellwood plant, but very often they were not cleaned sufficiently. As a result, the rejection rate of the brazed assemblies was approximately 25%. The carbide parts could be salvaged, but their recovery was expensive, and the stainless-steel caps had to be scrapped.

The company is now using the wet blasting process to clean the tungsten-carbide inserts, which are short cylinders about ½ in. in diameter and approximately 3/16 in. thick. These pieces are strung on wire like huge safety pins (photo 1), approximately 24 pieces to a wire. A wireful of inserts is about 6 in. long.

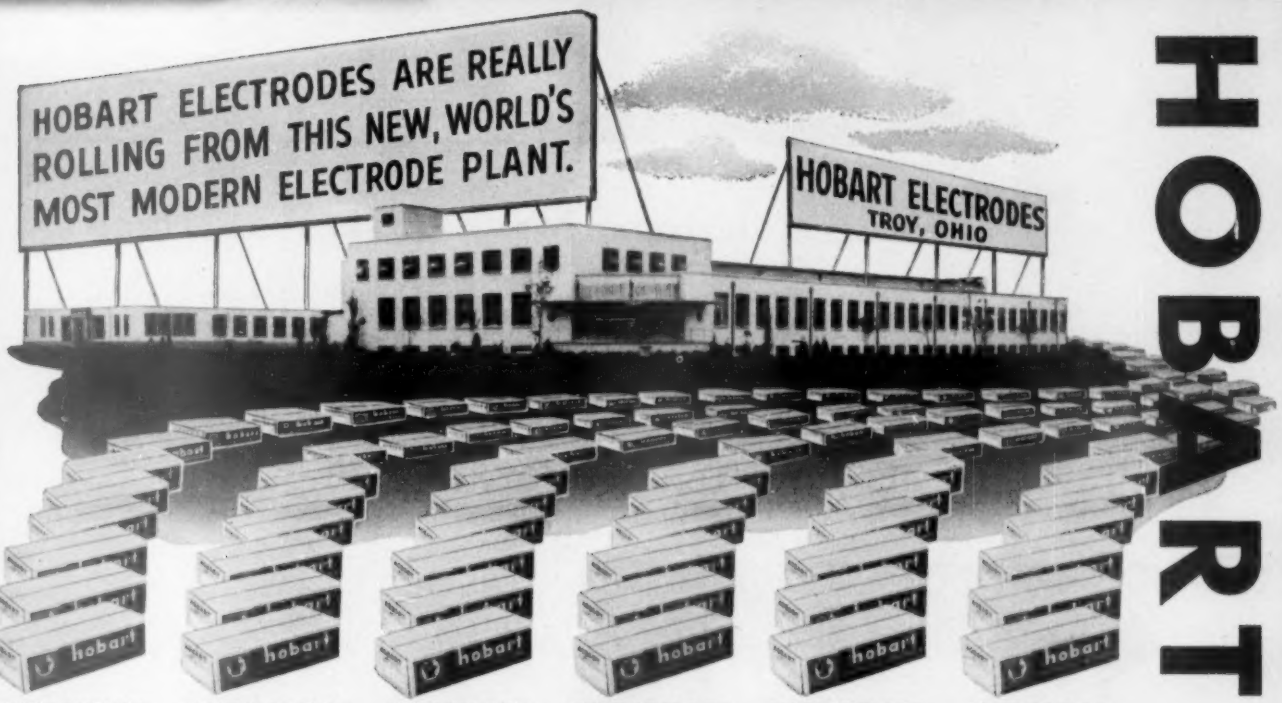
No work car nor fixture needs to be employed in the blast zone of the wet blasting machine. Photo 2 shows a view of the blasting compartment. Three wires of inserts can be seen on the expanded-metal flooring. The operator merely inserts the loaded wires into the blast zone by means of the armholes on the front of the machine (photo 3). He holds his arms through the armholes and manipulates each wire-strung pack of inserts in front of the abrasive gun with his hands while he operates the air valve with his knee.

Using 325 mesh abrasives, a wireful of inserts can be cleaned in 3 minutes 45 seconds. After removal from the blast zone, the parts are rinsed in water and dried before being silver brazed. Wet blasting is also used to clean the brazed assemblies, which emerge discolored. Since appearance is important with this type of product, each assembly is cleaned of its discoloration by being given a short blast.

Since wet blasting was inaugurated, the rejection rate due to improper flow of the brazing alloy has dropped to zero. The wet-blasting process is particularly valuable to this assembly because, owing to certain characteristics of the materials, chemical dips could not be utilized for scale removal.

Photos courtesy of American Wheelabrator & Equipment Corp., Mishawaka, Ind.

HOBART ELECTRODES



HOBART 10
E-6010
All position – general purpose, DC. For pipe lines, structural steel, boilers, tanks, shipbuilding, freight cars, etc.

HOBART 335
E-6011
All position – general purpose, AC or DC. For piping, pressure vessels, bridges, marine work, etc.

HOBART 12
E-6012
All position – general purpose, DC or AC. For tanks, frames, farm implements, machinery fabrication, etc.

HOBART 447
E-6013
All position – general purpose, AC or DC. For ornamental iron, bodies and frames, farm implements, etc.

HOBART 313
E-6013
All position – general purpose, AC or DC. For tack welding, body and frame work, ornamental iron, farm implements, etc.

HOBART 13
E-6013
All position – general purpose, AC or DC. For sheet metal, body and fenders, guards, fixtures, farm implements, etc.

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- ☐ Accessories Catalog
- ☐ Welder Catalog
- ☐ Welder's Vest Pocket Guide

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Congratulations Mr. J. P. H. Wasserman...

inventor of "Low Temperature Welding Alloys"

on your

80th Birthday...

EUTECTIC WELDING ALLOY

How do you suppose you'll celebrate *your* eightieth birthday?

By heading a vast industrial organization serving many thousands of firms throughout a continent?

By sailing close to 3,000 miles to celebrate with your son . . . and, incidentally to attend a Welding Congress?

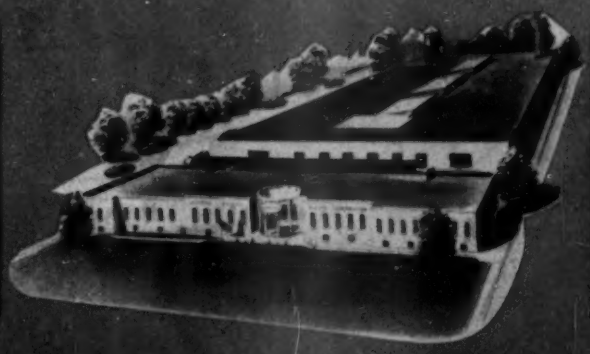
By stimulating, in word and action, the constant advancement of your industry and those allied with it?

If ever a man was "eighty years young," that man is J. P. H. Wasserman whose visit to us this month represents all this . . . and much more.

With pardonable pride, therefore, we take this space to bid him "Welcome To The United States" and to publicly acknowledge and proclaim the affection and respect he has so securely captured from all who know him.

WHO INVENTED 'Low Temperature Welding Alloys*'?

*A registered Trademark of Eutectic Welding Alloys Corporation



In 1906, J. P. H. Wasserman for the first time observed the phenomenon of "surface alloying" in brazing—and adapted it into his new process of **non-fusion welding**, later perfected by his son, Rene D. Wasserman, who, in 1940, founded "EUTECTIC" in New York. Eutectic Welding Alloys Corporation are the inventors, patentees and sole manufacturers of "Eutectic Low Temperature Welding Alloys",® that minimize or completely eliminate the dangers that conventional **high heat rods invite**, such as: warping, distortion, stresses, embrittlement, etc. They are now used in over 78,000 industrial plants throughout America and sold and serviced in over 67 countries throughout the world! These **new and different** products, developed by "America's Leading Institution Devoted to the Research and Manufacture of Specialized Metal-Joining Alloys" are today saving millions of dollars for others and can save time, money and materials for YOU too!

EUTECTIC

EUTECTIC WELDING ALLOYS CORPORATION

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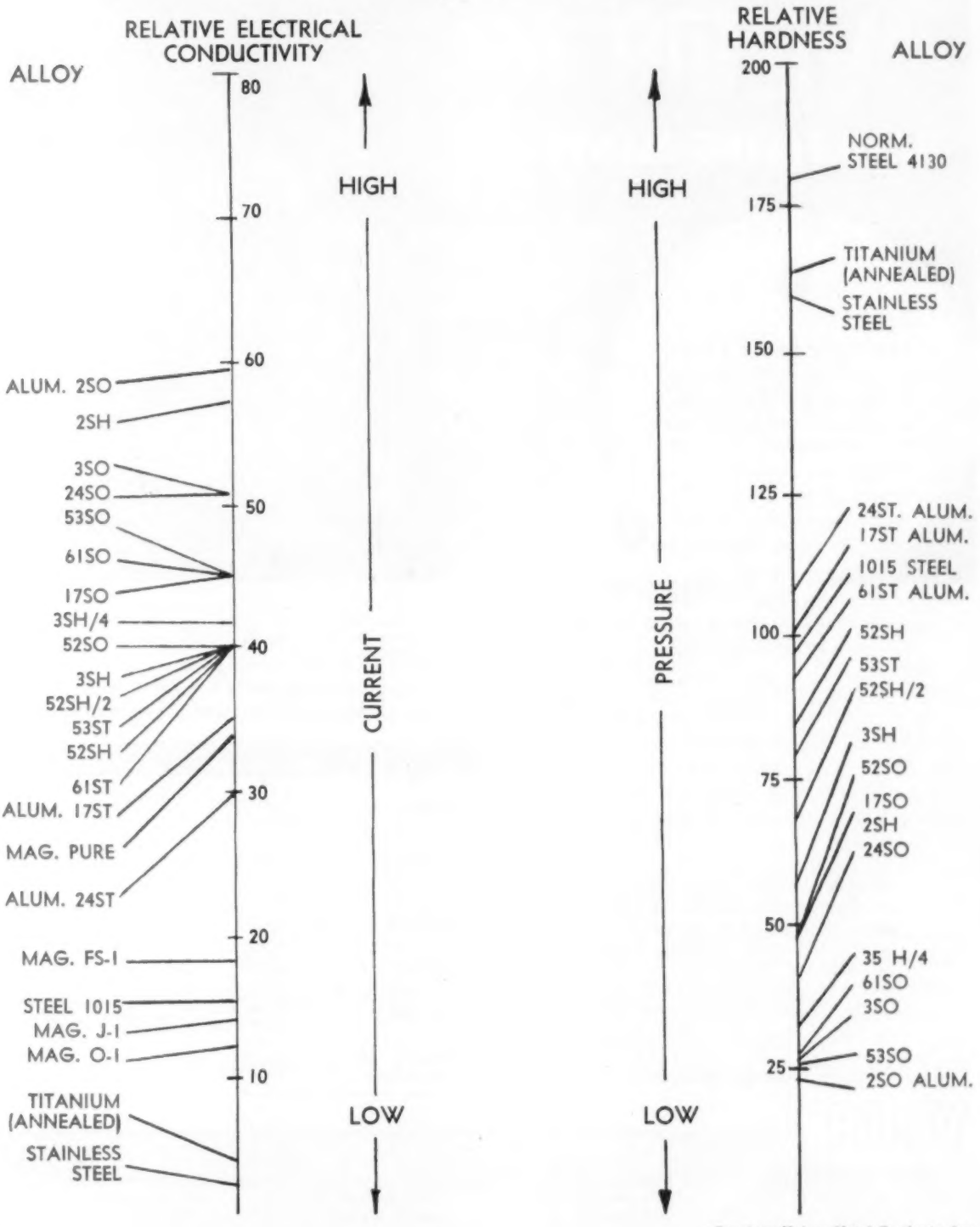
SOCIETE DES SOUDURES CASTOLIN, S. A. — LAUSANNE

A WELDOR'S WOES

ITCHBORD, THE WELDOR, BURNS ALL HIS RODS SHORT--
BUT HOW THAT SUPPLY CLERK CAN MAKE ITCHBORD SNORT!
SOME OF THE BOYS ARE THROWING AWAY TOO LONG A STUB. WOULD YOU HELP USE THESE UP?
SLOW BURN
SOUNDS WE CAN DO WITHOUT
THE NOISE OF EGGS FRYING THRU A LOUDSPEAKER THAT ACCOMPANIES A HOT BLOB IN THE EAR.
SNAP!
HISS
PING!
THE SHRILL PING OF A LIGHTLY TACKED SPOT LETTING GO.
THAT UNEXPECTED POP WHEN A GUY SNEAKS UP FOR A LIGHT.
POP!
FRANK TABOR
SOME PEOPLE HAVE NOTHING TO DO, IT SEEMS, BUT STAND AROUND ON YOUR CABLE!
SOME GUYS DON'T SAY ANYTHING WHEN YOUR HOOD IS RAISED--
BUT JUST START TO WELD UP YOUR JOB--
WHY IS THE ARC SO BRIGHT? HOW DOES THAT METAL STICK ON THERE? YAKKITY-YAK
YAK
YAK
YAK
*OUR THANX TO ANDREW VENA, PHILADELPHIA, PA., FOR THESE IDEAS. LET'S HEAR FROM ALL YOU WELDORS. SEND YOUR GRIPES IN TO THIS DEPT.

Material Characteristics as Related to Resistance-Welding Current and Pressure



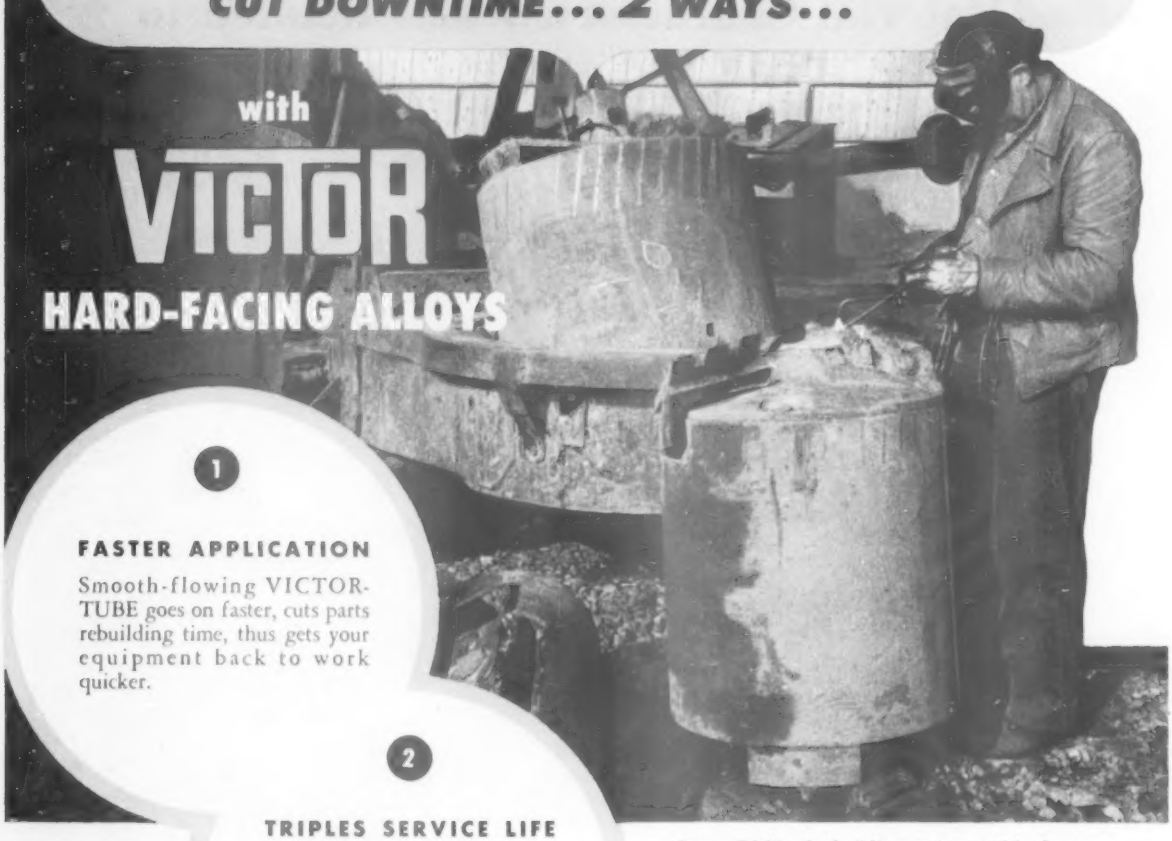
Courtesy Kaiser Metal Products, Inc.

CUT DOWNTIME... 2 WAYS...

with

VICTOR

HARD-FACING ALLOYS



1

FASTER APPLICATION

Smooth-flowing VICTORTUBE goes on faster, cuts parts rebuilding time, thus gets your equipment back to work quicker.

2

TRIPLES SERVICE LIFE

where severe abrasion is encountered, parts rebuilt with VICTORTUBE outwear the original three to five times — *your equipment stays on the job longer* . . . and you reduce parts inventory.

Owner Ed Blood rebuilding teeth on 28" bucket auger with VICTORTUBE "Special" at Berkeley Bit Service, Berkeley, California. VICTORALLOY used on bucket wear pads (left).

Prolong Parts Life NOW with These VICTOR Hard-facing Alloys

THIS HARDFACING ROD	FOR THESE CONDITIONS	FOR SUCH EQUIPMENT
VICTORALLOY	Abrasion and severe impact	Tractor rollers, dredge pump impellers, bucket lips and teeth, rock crushers, steel mill wobblers
VICTORTUBE	Severe abrasion	Scarifier teeth, dredge cutter blades, posthole augers, oil field tools, ditcher teeth
VICTORITE	Earth abrasion or sliding friction	Plowshares, cultivators, steel mill guides, cement chutes, shaft bearings, rolling mill guides
VICTORITE 1	Corrosion, heat and abrasion	Saw-teeth, carbon scrapers, wire guides, rocker arms
VICTORITE 6	Red heat, impact, corrosion and abrasion	Blanking, forming and trimming dies; cams, hot punches, pump shafts
VICTOR TUNGSMOOTH	Thin cutting edges	Coal cutter bits, brick augers, pug-mill knives, screw conveyors

Available in a full range of sizes for both acetylene and electric AC and DC applications, either hand or automatic. Order a supply from your VICTOR dealer today . . . look for this sign.

Dealer inquiries invited!

H2

VICTOR for welding

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BRITONS CAN HAVE PROSPERITY —If They Want It

What is required to get Britain, our key ally in the grand alliance of the free world, firmly back on her economic feet? The purpose of this message is to throw light on this crucial problem, which afflicts our other European allies also.

At the moment, Britain is enjoying a respite from the economic crises (of 1947, 1949 and 1951-52) which have plagued her postwar course. This respite may well continue for some time. But almost no one whose judgment is trustworthy believes that Britain has acquired sufficient economic strength to safeguard her against further economic crises in the years immediately ahead.

Two British Views

New and clear light on what should be done to that end has recently been shed by two noteworthy British publications. One is a book, "We Too Can Prosper," by Graham Hutton, distinguished British economic writer and administrator. The other is an article, "The Riddle of Prosperity," published by THE (London) ECONOMIST, Europe's most eminent economic journal.

Combined, these two publications present in sharp relief the basic problem that must be handled successfully if Britain is to be safely solvent. As is implied by its title, ***the Hutton book demonstrates that Britain can be made prosperous by readily feasible procedures, patterned on what has been done in the United States, to increase its industrial efficiency. But, says THE ECONOMIST, with Mr. Hutton's book in mind, this is not the most basic problem, which is, "How shall we make the British people determined to be prosperous?"*** This is a problem of incentive or motivation.

Compared with that of the United States, average industrial efficiency in Britain, as in most of Western Europe, is low. In his book Mr. Hutton remarks that "fifty years ago an American industrial worker turned out roughly the same amount in a day as his opposite number in Britain, Germany or France. . . . Today, he turns out from two to five times as much."

In large part it is this lag in output per hour or "productivity," as the technicians call it, which makes Britain and other key countries in Western Europe a continuing prey to economic crises. Moreover, the great disparity in productivity between the U.S.A. and most

of Western Europe is a major barrier to knitting the free world into a smoothly working economic whole. As one observer put it, "when the American economy catches a cold, the European economy gets pneumonia." This is largely because Europe is so much weaker in productive strength.

No Shortage of Knowledge

Yet the knowledge which would enable the countries of Western Europe, and particularly Britain, to increase their industrial productivity has been mobilized and is readily available to them. It is with this process for Britain that Mr. Hutton's book is concerned. In the book he summarizes the findings and conclusions, virtually all of them unanimous, of 66 teams, composed of British industrial managers, technicians, shop workers and labor leaders. Over a period of three years these teams completed a comprehensive series of inspection and study trips in the United States under the sponsorship of the Anglo-American Council on Productivity. The product of that effort, he remarks, is "a set of documents the like of which, on such a scale and of such practical value, has never been seen in the history of international and cultural borrowing."

Psychology the Key

From study of these documents, Mr. Hutton concludes that better capital equipment is the key technical ingredient of higher industrial productivity in Britain, and constitutes "the most urgent . . . need of British industry." But he finds that ***even without new capital equipment a "15% rise in productivity can still be achieved by reorganization of work," and that such an increase would "solve Britain's chief social and economic problems."***

Then why is not such an increase in productivity, demonstrated by the Anglo-American productivity teams to be so clearly within technical grasp, promptly forthcoming? Mr. Hutton, quoting one of the team reports, remarks that, ***"'the greatest obstacles to increased productivity are psychological rather than technical.'*** We have to deal first and foremost with men, not machines." And THE ECONOMIST, pursuing the line of inquiry suggested, reaches the conclusion that, by and large, the people of Britain do not want to prosper by being more efficient. THE ECONOMIST says:

> "The real secret of American productivity is that American society is imbued through and through with the desirability, the rightness, the morality of production. . . . But in Britain, if any moral feeling at all survives about economic matters, it is usually a vague suspicion that economic success is reprehensible and unworthy. From this difference in attitudes everything else follows."

"How," asks THE ECONOMIST, "shall we set about restoring some belief in the rightness of effort, the morality of success?" For this question it has no ready answer. Neither have we. We are confident that the British people will neither be cajoled nor coerced into trying to match our productivity. Basically the problem seems to be to demonstrate clearly to them the truth of the proposition, set down by Graham Hutton, that "there is no goal, aim or end before a Good Society which the raising of that society's material productivity cannot render easier of achievement." Doing that in an old and settled country like Britain is obviously an extremely formidable undertaking. But ***until it is done, the crucial job of getting Britain and the rest of Western Europe firmly on its economic feet will remain to torment all of us.***

McGraw-Hill Publishing Company, Inc.

HEAT-RESISTANT ALLOYS

(Continued from page 56)

size of the overall assembly. If the entire product can be cast easily in one piece, this is the method usually favored. In many instances, however, casting difficulties can be considerably reduced by welding separate castings together.

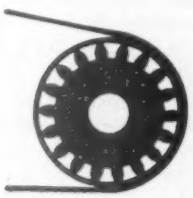
An important precaution to observe in cast-weld constructions is to avoid the welding of thick and thin sections. The unequal stresses set up create a strong tendency toward warpage. In parts having varying sections, the union between a light and a heavy section should be loose when the equipment is to be subjected to an abrupt change in temperature.

When two castings are to be welded flush with a butt weld, the joint should be suitably beveled to provide good weld penetration and a minimum of residual stresses.

One basic design precaution is to avoid the welding of corners. The castings should be designed so that seams fall a few inches from the corners, whether they are vertical or horizontal. Another point to remember is that the radii of curvature should be as large as feasible; short radii tend to set up stresses that may cause failure in service.

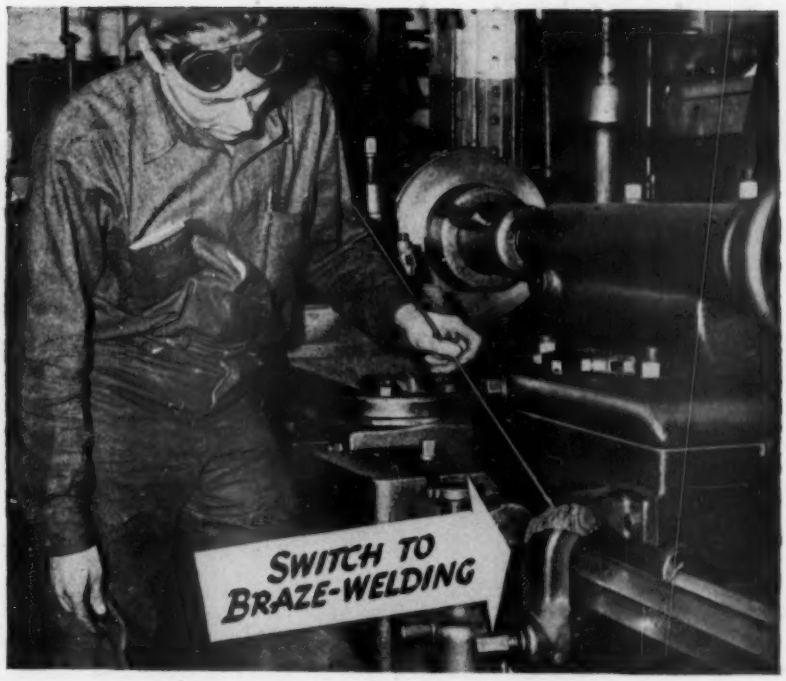
Noisy Made Noiseless

By W. F. Schaphorst



A mechanic who was handy with a small welding outfit converted a noisy metal gear drive into a noiseless belt drive. The sketch shows how it was done.

The mechanic welded a flat band over the tips of the gear teeth, and that solved the problem. In other words, he made pulleys out of the gears and set the shafts slightly farther apart. This eliminated the noise. The belt drive takes care of the load without the slightest difficulty; in fact, output has been increased more than 20%.



Make quick, lasting repairs

without dismantling

with Bridgeport No. 192 Low Fuming Bronze Rod

When this gear rack bracket broke down on a large, heavy-duty lathe, there was no need for dismantling . . . no lengthy downtime. The bracket was bolted in place to maintain alignment, then braze-welded.

Because braze-welding requires only local preheating, repairs can be made *right on the equipment* in many cases similar to the one above. Result: lower repair costs.

What's more, repaired sections are often stronger and less brittle than the original casting. Bridgeport braze-welding alloys are also extremely useful for building up worn surfaces, repair of cast-iron or bronze castings and the regular production of fabricated steel parts.

Bridgeport's booklet, "Bronze Welding Alloys," contains complete information. Write for your copy.

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Bridgeport 2, Conn. Established 1865
Mills at Bridgeport, Conn., and Indianapolis, Ind.
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Bronze Welding Rod A PRODUCT OF **BRIDGEPORT BRASS**

on the job

AN OLD tire stretcher makes a dandy jig for welding up gear blanks

IT'S wrought iron to resist salt water

Gears Welded up to Order

FRANK C. Tabor, cartoonist-author of "A Weldor's Woes" (see page 66), sent us the top left picture of himself in toiling garb. When he isn't drawing cartoons for THE WELDING ENGINEER and other magazines, Frank welds gear blanks for the Sheridan Gear and Machine Co., Sheridan, Ore. The gear in process of fabrication in the picture is a big triple sprocket. The band is rolled from a piece of steel measuring 2 by 5 in.

Writes Frank:

"That thing in back of me is an old tire stretcher, which makes a dandy welding jig. In the lower right-hand corner are some 120 double sprockets welded and ready for machining. We make hundreds of such sprockets, ranging in size from an OD of 45 in. down to the size of a quarter. On this particular job, I'm using ¼-in. electrodes and a 500-amp a-c welder."

Tabor goes on to call attention to the electrode holder parked on the carbide can at the left of the picture. This empty can can't explode in case of an accidental short-circuit—in which respect it differs greatly from a gasoline drum (see article, "How Accidents Are Born" in the June, 1953, issue of THE WELDING ENGINEER).

Underwater Chamber

DESIGNED for installation below the water level, the huge welded tank pictured at top right is made entirely of wrought-iron plate to resist salt-water corrosion. The tank was designed by engineers of the Delaware, Lackawanna & Western Railroad for the sealed-in protection of vital operating machinery at the railroad's coal pier No. 5 on the Hudson River at Hoboken, N. J. Measuring 12 ft 6 in. long by 10 ft wide and 8 ft deep, the tank was built of ⅜-in. wrought-iron plates by L. O. Koven & Brothers, Inc., Dover, N. J. Photo from A. M. Byers Co.

Boosted Output 10 Times

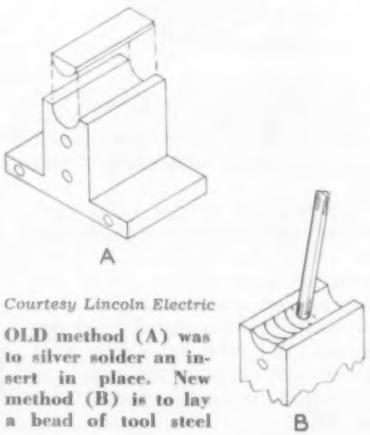
By C. G. Herbruck

AN EASY change netted one manufacturer of solenoids a 37% saving in material cost and a tenfold increase in output. The change was from silver soldering to arc welding.

A solenoid is an electromagnet that may be used to operate valves, levers and other control mechanisms through movement of its laminated core. The point of contact on the core is called the anvil. For optimum wearing qualities, it must have a hardness of 55-60 Rockwell C. Former practice was to silver solder a hardened steel insert into a machined groove in the anvil face (A). Production was about 100 anvils per operator per day.

Under the new method, the anvils are clamped end-to-end in a fixture and a 5% chromium tool steel is deposited in the groove (B). The deposit is laid in one pass, using an air-and oil-hardening electrode. An average of 55 pieces can be faced with one pound of electrode, and a single operator can turn out 1,000 anvils per day.

In attaching the solenoid to its steel base, arc welding was again applied. A single pass made with a mild-steel electrode resulted in tripled production.



Courtesy Lincoln Electric

OLD method (A) was to silver solder an insert in place. New method (B) is to lay a bead of tool steel

Courtesy Detroit Stamping Co.

New Fixture Hikes Output

UNITED Stove Co., Ypsilanti, Mich., a subsidiary of Gar Wood Industries, increased the production of air-ducts for automatic washer-driers over 70% by redesigning the fixture to use toggle clamps instead of the plier-type clamps that were formerly employed. The frame member of the fixture was also redesigned.

The original fixture frame weighed 65 lb and two men handled the unit while the air-duct assembly was being spot welded. The present fixture weighs but 22 lb and requires only one man for the spot welding. Production has risen from 39 to 67 pieces per hour.

* * *

Safe "Parked" Electrodes

By Andrew Vena

IT FREQUENTLY happens that a welder finds it necessary to "park" an electrode in the jaws of the holder while he does something else. The thoughtless, impulsive—almost instinctive—thing is to leave the holder clamped to the bare end of the rod and trust that its other end won't accidentally short to ground when you turn your back. It's bad business!

When you must leave an electrode "parked"—either a whole one or a stub—see that the holder is clamped near its middle, over the coating and not on the naked metal. Then the rod is safe from blinding flash, arcing and other mishaps in case of an accidental short to ground. Where there is much metal around, accidental grounding can easily occur. To clamp the parked electrode on the coating is a good, common-sense precaution to observe. Make it a habit.

no welding acrobatics!
Awkward, fatiguing positions hinder production . . . waste man-hours. Help your operators weld more efficiently, with less effort . . . by using
Pandjiris "Weldmore" Engineered Positioning Equipment
this is the right way!
Pandjiris positions "all three"—Man, Weld-Job and Head – for easy downhand welding. No straining, twisting or crouching. No horizontal, vertical or overhead welding. The operator stands at ease and works in comfort.
Whatever the most efficient position for your welding, we engineer it for you.
Write today for illustrated folder.
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Join difficult light-gauge metals! Make wear- and corrosion-resistant overlays

...using AMPCO-TRODE* FILLER RODS with the inert-gas tungsten-arc process

HERE'S an easier way to join light-gauge difficult and dissimilar metals. Use Ampco-Trode filler rods with the inert-gas tungsten-arc process. You can join iron-base metals, copper alloys to iron-and nickel-base alloys, cupro-nickel and many others. And you can also make dense, high-quality overlays that resist wear and corrosion.

Five grades of Ampco-Trode filler rod give you good welds with practically any hardness you need. Here's the selection:

Filler Rod	Deposit hardness (BHN 3000 kg. load)
Ampco-Trode 10	160-190
Ampco-Trode 160	190-220
Ampco-Trode 200	250-280
Ampco-Trode 250	310-340
Ampco-Trode 300	350-380

Use Ampco-Weld Flux with inert-gas processes. Ampco-Weld Flux removes surface oxides, lowers the amount of preheat and current, speeds welding. Keep your welding surfaces clean and dry to make the highest quality welds.

Why put up with failures in joining difficult light gauge metals? Order bare Ampco-Trode filler rods and Ampco-Weld Flux from your Ampco distributor or write us today.

*Reg. U. S. Pat. Off.

AMPCO METAL, INC.

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Milwaukee 46, Wisconsin

West Coast Plant, Burbank, California W-121

30 YEARS AGO

(Taken from THE WELDING ENGINEER *of Sept., 1923)*

THE first all-welded gas holders in the world, near Melbourne, Australia, are described in this issue by Joseph N. Reesom, of Australia. The holder illustrated is one at Fitzroy. There were 15 miles of welded seams in the completed structure.

—30 YEARS AGO—

ARC-welded repair of foundry flasks is described by A. M. Candy in this issue. Costs are described as 70c per hour for labor, 8c per lb for wire and power at 3c per kwh.

—30 YEARS AGO—

A STRANGE series of events gave welding a black eye in the early years of this century, says the editor. It seems a weldor left a small pin hole in one of his welds. A small amount of oil leaked out of it and was ignited by a cigar thrown away by a tourist. A disastrous prairie fire was the result and the welded pipeline was blamed!

—30 YEARS AGO—

ACTIVE help to welding schools is the pledge of the recently organized educational committee of the Gas Products Association.

—30 YEARS AGO—

HAROLD S. CARD, associate editor of THE WELDING ENGINEER, is the proud father of a fine baby girl. Harold is doing well.

—30 YEARS AGO—

E. L. MILLS, sales manager of the Bastian-Blessing Co., when last seen, was headed for the Northwest carrying a high powered bear gun, and accompanied by all the fox terriers he could capture in his neighborhood. He has promised the Chicago Section of AWS a barbecue if he bags a bear.

—30 YEARS AGO—

PROMINENT welding industry men visiting in London at the present time include A. Cressey Morrison, F. M. Morehead, A. F. Jenkins, Lorn Campbell and Lorn Campbell, Jr.

—30 YEARS AGO—

RAPID growth in just four years time is reported by the China Oxyacetylene and Welding Works, Shanghai, China. It is now one of the largest and best equipped welding shops in the Far East. They keep four portable arc welders and three oxyacetylene welding outfits in constant service.

NOW-Make Your Own Oxygen and Nitrogen in One Generator

...and Save Up to 50%!

With INDEPENDENT'S newly-designed generators, you can make your own high-purity oxygen and nitrogen from the free air . . . and in the same generator.

You reduce costs up to 50% by eliminating handling costs . . . vaporizing costs . . . evaporation losses . . . residual losses . . . and transportation costs.

INDEPENDENT Generators are available in any capacity, any purity and any pressure. Put your oxygen-nitrogen problem up to us . . . our engineering department will gladly submit recommendations . . . no obligation, of course!

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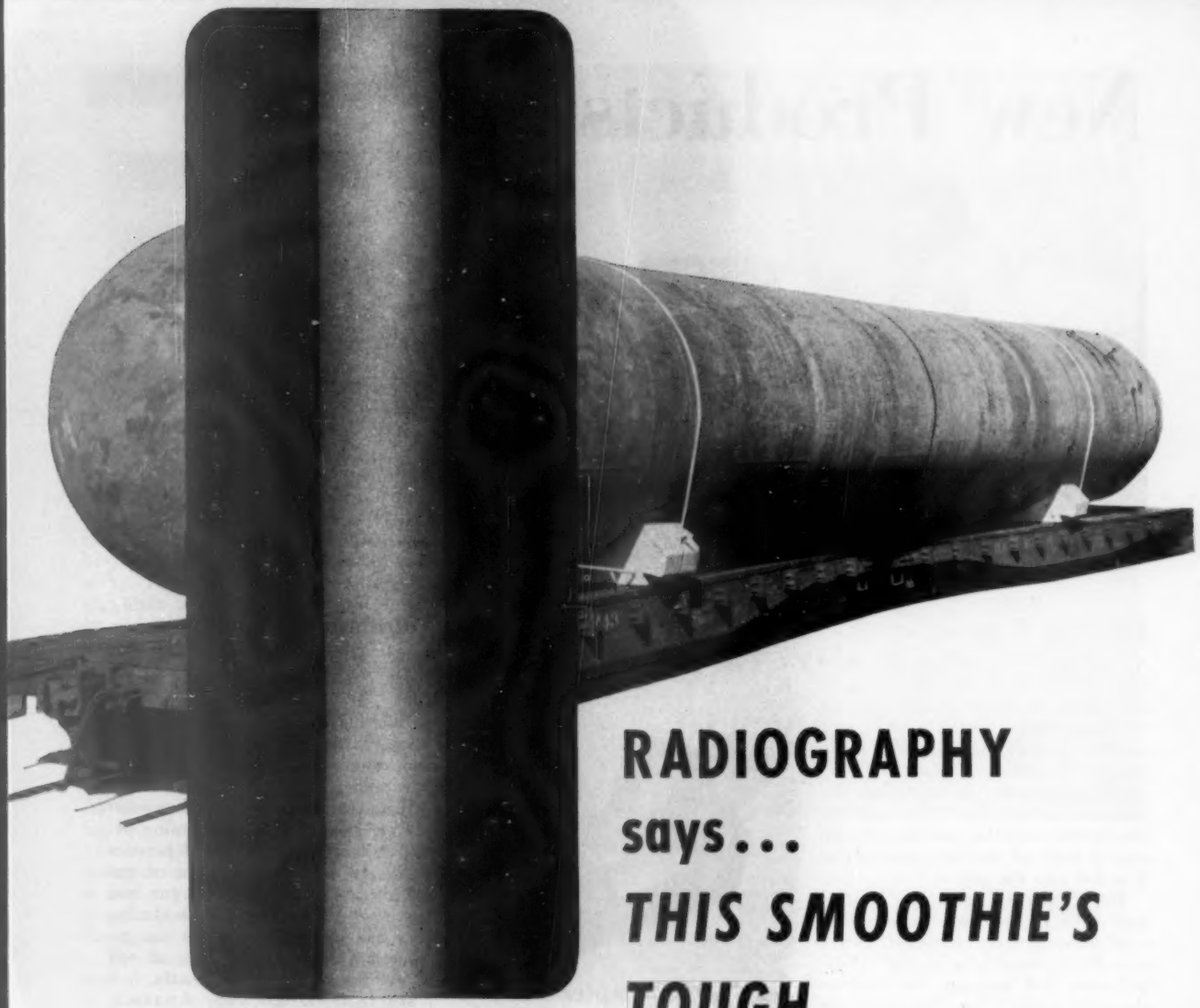


RADIOGRAPHY says... *THIS SMOOTHIE'S TOUGH*

This 90-ft. pressure vessel looks smooth, clean, and neat. But that's not all that welding did for it. It helped make the tank strong and tough with less weight and at lower cost.

Designers of pressure vessels can take full advantage of the welding process because each weld can be proved sound by radiography.

This is how radiography widens the opportunities for welders—why it can increase your business.

Wouldn't you like to know more about how it can help you? Get in touch with your x-ray dealer and talk it over.

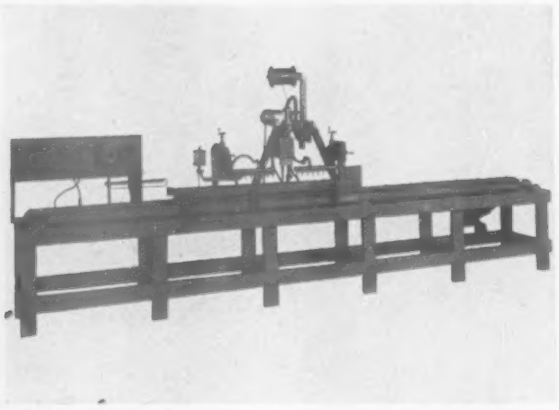
EASTMAN KODAK COMPANY
X-ray Division, Rochester 4, New York

Radiography . . .
another important function of photography

Kodak
TRADE-MARK

New Products . . .

"FILLERARC" welding is G-E's approach to rapid fabrication of aluminum, mild steel, stainless and copper



CONVEYOR positioning on new soldering machine increases production and raises quality of joints made

Fillerarc Welding

A COMPLETELY new welding generator is featured in the new G-E "Fillerarc" consumable-electrode gas-shielded arc welding process. Rated at 450 amp continuous duty, the generator has a rising volt-ampere characteristic to make the process self-regulating. Designed to give constant arc length, the new welder supplies just enough current to melt off the electrode wire as it is fed into the arc.

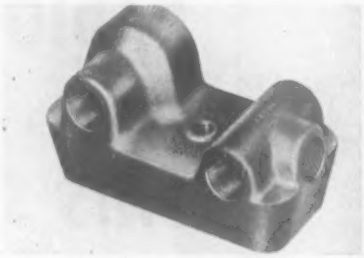
The "Fillerarc" gun has knurled feed rolls for pulling the electrode wire from a spool mounted in the wire drive assembly, a trigger to control wire feed and gas flow and an electrical contact tip. The 400-amp, water-cooled gun is capable of feeding wire from 0.030 to 0.093 in. in diameter, making the fabrication of thin sections quite practical. Wire feed speed can be adjusted from 0 to 750 ipm by means of a remote two-speed switch and the set speed is held constant by an electronic motor control in the wire drive unit.

The "Fillerarc" wire drive unit is mounted on a portable carriage containing a "Thy-mo-trol" motor control. This control utilizes electronic tubes to convert alternating current to controlled direct current for operating a d-c motor. The wire drive unit incorporates a voltmeter for indicating wire feed speed in ipm as well as arc voltage, a gas solenoid valve, control relays and a wire spindle.

Electrode wire of aluminum, stainless steel, mild steel, copper, magnesium, and other alloys may be employed with either argon or helium. The gun can be used in down-hand, vertical or overhead positions to weld aluminum of any alloy in thicknesses from 1/32 to 3 in. and stainless from 1/16 to 1 in.

GENERAL ELECTRIC Co., Schenectady, 5, N.Y.

* * *



L-P Tank Adapter

JOB shops making L-P gas tanks for trucks and autos will be glad to hear about a new forged steel mobile tank adapter. With the "S and L" adapter, only one hole need be cut in the tank, whereas six holes are required otherwise. The single adapter gives the necessary outlets for vapor return, vapor withdrawal, liquid fill, liquid withdrawal, pressure relief and fixed liquid level gage. Only two pipes are needed. It is made on a taper of 10 deg for installation in the side, end or top of the tank. The steel skirt of the adapter also eliminates welding distortion problems and heat damage to the pipe threads. The adapter is made in accordance with the National Board of Fire Underwriters Pamphlet No. 58.

It comes in two sizes, with five ¾ in. outlets and a ¼ in. liquid level gage outlet or with four ¾ in. outlets, one 1¼ in. fill valve outlet and a ¼ in. fixed liquid level gage outlet.

S AND L MFG. Co., Gardena, Calif.

Automatic Soldering

BUILT as a self-contained unit, the Mogul soldering conveyor fixture needs only to be connected to gas, air and electricty to commence opertions. Parts are automatically carried under a mounted soldering gun. Solder is deposited only in the work seam with the aid of a seam locator, an automatic positioning device. A master control panel permits rapid and simple adjustment of gas and air flow to the soldering gun and burners. The adjustable soldering horn has movable rails that can be lowered or raised, moved in or out to conform to various contours.

METALLIZING CO. OF AMERICA, 3520 W. Carroll Ave., Chicago 24.

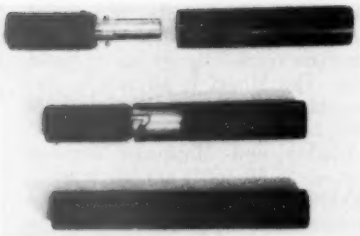
* * *

Aluminum Rod

A NEW cast aluminum welding rod for torch work in assembling, repairing and reclamation of aluminum sand castings is called All-State No. 355. Claims, in addition to a notable plastic range (1,025-1,150F) are that it color matches, has the same corrosion-resistance, and responds to heat treatment identically with standard type 355 aluminum alloys.

It is intended for welding under such specifications as ASTM B26-50T. It meets specification QQ-R-566 Type I Class FS-RAL-355 and applications already proved for it include welding P51, P6 and other aluminum castings of various tempers where analysis corresponds to type 355. The rods come in 1/16, 3/32, ⅛, 3/16, and ¼ in. sizes, 36 in. long.

ALL-STATE WELDING ALLOYS CO., INC., 249 Ferris Ave., White Plains, N. Y.



Cable Connector

THE new "Dalweld" detachable welding cable connector is designed to eliminate accidental disconnection and is made for rough use. Connectors have expander-type male end which makes a large area contact. When this is inserted into the female end with a quarter turn it makes a wipe-joint fit for complete electrical contact, which assures maximum conductivity. Current carrying parts are made from bar brass, machined to close tolerances. The casing is a heavy insulating fibre tube. The connectors are made for both solder and mechanical connections in 400 and 600 amp capacities and are shipped complete ready to be attached to the cable.

DALWELD CO., 1 Bertel Ave., Mt. Vernon, N.Y.

* * *

Aluminum Flux

AN advanced type of aluminum welding flux, Type 202, is being marketed by Solar Aircraft Co. The first aluminum flux to be developed by Solar, it is said to reduce oxides immediately upon application and to do so throughout the heating cycle.

The flux is said to be easily removed after welding and will not produce corrosive pitting on the parent metal. The flux changes to liquid as welding heat is reached on the workpiece and therefore serves as a good temperature indicator. It is especially recommended for oxyacetylene welding where high heats are dangerous.

The flux can be used as a back-up material on butt or T-joints to control penetration and can also be used to eliminate the oxide notch on the back of the work.

Perhaps most important, the flux allows the operator to readily see the molten puddle and no puddling stick is needed to remove oxide slag. The opaque slag blanket is carried off automatically by the fluidity of the flux. Type 202 aluminum flux is available in 1-lb containers through welding supply dealers.

SOLAR AIRCRAFT CO., 2200 Pacific Co., San Diego 12, Calif.

* * *

A CLASSIC *is something that everybody wants to have read and nobody wants to read.* —*Mark Twain*

IF IT'S A VALVE
FOR WELDING—
ROSS HAS IT

Close-coupling of valve to cylinder! That's the story behind the remarkable success of the *new Ross In-Line Master Valve.*

Users claim several important advantages. By placing the master valves (A & B) at the cylinder (D), air supply and exhaust are speeded up appreciably. This in turn permits faster movement of the cylinder piston and materially increases production.

At the same time, the close coupling means that two lengths of large diameter piping between valve and cylinder—pipes continually filled and exhausted with non-productive air—are replaced by two short connecting pipes (F). The resultant saving in air with every movement of the piston considerably reduces operating costs.

Operation is by a small, conveniently located 3-way pilot valve (C). It is supplied through tubing (E) and connected to the master valves by tubing (G). It may be mechanically, manually or electrically controlled. Hand or foot operation is greatly facilitated by the use of the smaller, more easily actuated pilot model.

The complete story of possible advantages in your production will be gladly furnished without obligation. Ask for Bulletin No. 302.

Ask Ross for Any

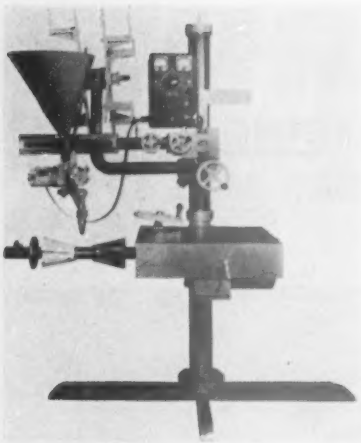
Ross makes valves only – hundreds of types and sizes. Take advantage of the experience gained in over a quarter century of concentration on control and application of air power!

ROSS OPERATING VALVE COMPANY

Ross Air Control

116 E. GOLDEN GATE AVE., DETROIT 3, MICHIGAN

Engineers at Your Service in all Principal Cities



Auto-Rebuilders

SINGLE and twin welding-head automatic rebuilding machines now available enable shops to rebuild wheels, pulleys, track rollers, idlers and cones. The Mir-O-Col K-2 machine will handle work up to 40-in. in diameter and will deposit 30 in. of bead per minute. It will handle wire up to ¼-in. in diameter.

Distinctive features of the K-2 include an adjusting wheel permitting fine vertical adjustments of 1/64-in. A simple lock on centers prevents slippage and insures perfect concentric build-up. A gear reducer on the motor provides variable spindle speeds between ¼ and 3 rpm, an adjustable welding table, a large capacity flux can and a bar guide to keep the flux around the arc.

The Mir-O-Col K-2 "Twin-Head" has the same precision features as the single head. It can handle two jobs of different diameters at the same time. Separate rack and pinion assemblies enable one operator to oversee rebuilding of a 40-in. idler and a 20-in. roller simultaneously.

MIR-O-COL ALLOY CO., 312 North Avenue, Los Angeles 21, Calif.

* * *

Sander-Polisher

TWO counterbalanced heads on a new sander-polisher are said to give fine finishes on metal, woods and other surfaces. Special cups are available for all types of grinding, smoothing and polishing. The translatory action of the twin heads is said to eliminate swirl marks, scuffing or burning. The tool weighs 8 lb and is available in either electric or air operated models.

CYCLO MFG. CO., 2140 So. Delaware St., Denver, Colo.

* * *

Cleaning Steel

EXTRA-HEAVY soils may be removed from iron and steel in one operation with Oakite No. 26 composition, says the company. The new solution has the following advantages: 1) quick penetration of soils 2) thorough soil removal 3) good rinsing action—no insoluble or oily films left on surfaces to interfere with painting or plating 4) simplicity in use 5) economy—realized from one-step cleaning.

OAKITE PRODUCTS, INC., 157 Rector St., New York City 6.

* * *

Redesigned Welders

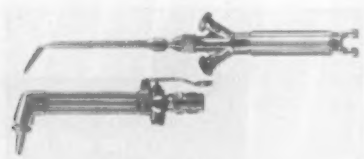
THE M&T 200, 300 and 400 amp d-c generator welders have been redesigned to include the following features: a one-dial control providing close adjustment of the welding current and a magnetic motor starter.

Using the single dial, the electrode selector is first set to the proper size and then the calibrated current dial is turned to the desired heat. A reversing switch provides quick change of polarity.

The motor starter is a magnetic across-the-line contactor operated by push button. It has two automatic-reset thermal-overload relays to protect against severe and continuous overloads and low line voltage.

METAL AND THERMIT CORP., 100 East 42nd St., New York City 17.

* * *



Two New Torches

THE new Model J aircraft welding torch (at top above) made by Marquette has a special O-ring seal to guard against gas leaks. It is available with 8 tip assemblies for welding materials from 20 gage up to ⅜ in. thick. The Model L aircraft cutting assembly (bottom torch), although small, cuts up to 2-in. steel.

Another new Marquette development is the Model H automatic welding torch (with pilot-light flame) that produces a full "pre-set" heat. The Model H is said to save as much as one-half the oxygen and acetylene usually lost between welds.

MARQUETTE MFG. CO., 307 E. Hennepin Ave., Minneapolis 14, Minn.

* * *

Heavy Positioner

THE new Model P3000 Leader welding positioner has built-in collector discs (1,000 amps) to assure positive ground. This feature eliminates bearing and gear failure caused by stray electrical currents.

Both the table and tilt are driven by an enclosed gear train. The Acme-powered tilt has self-locking gears and can be swung through 120-deg from the horizontal position. Limit switches are built in. To eliminate back lash the table drive is powered by a spring-loaded worm gear. Power source required is 220/440 volt 3-phase at 10/5 amp.

LEADER WELDING AND MFG. CO., 2418 Sixth St., Berkeley 2, Calif.

* * *

Slug Inserts

"SLUG INSERTS" or "spot lay" materials are a recent development by the D. E. Makepeace Co. These materials consist of silver or silver alloys discs with solder on one side that are inserted in pre-punched holes on brass strip stock. The strips and inserts are brazed in a furnace, locking them into position for blanking and forming into various types of electrical contacts. The comparatively expensive silver or silver alloy is cupped-up only where it is needed.

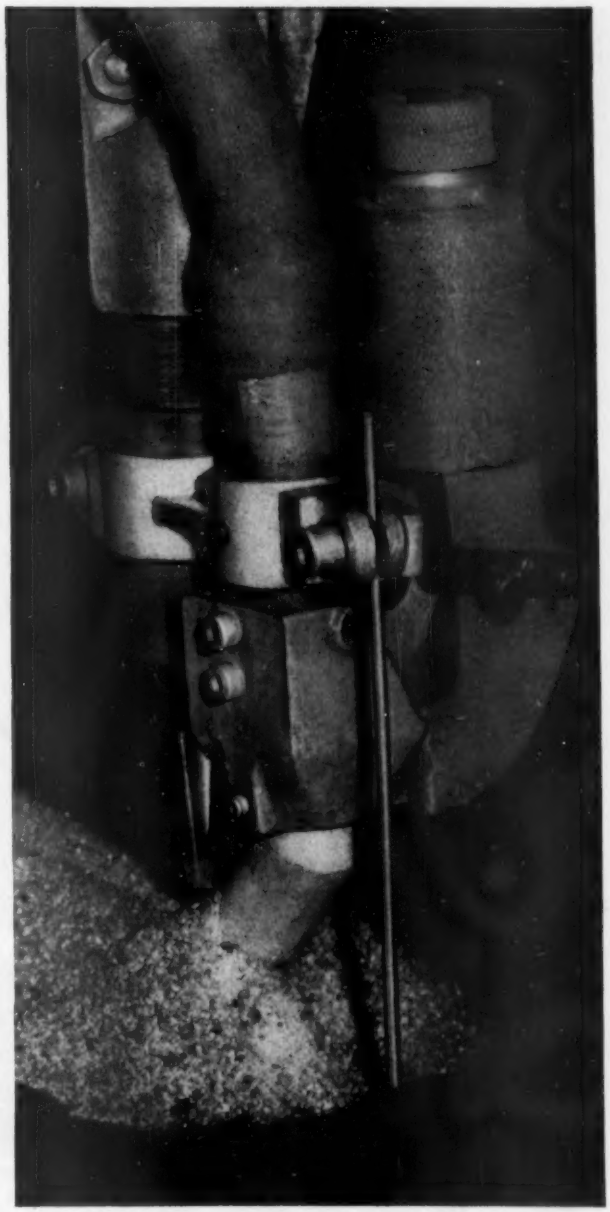
D. E. MAKEPEACE CO., Div. of Union Plate and Wire Co., Attleboro, Mass.

Two important parts of

UNIONMELT WELDING

Trade-Mark

You Can't See



This is UNIONMELT welding—instantly recognized by the special granulated material you see blanketing the weld. *You can't see* the powerful electric arc that fuses the metal beneath at the highest production rate attainable. No sparks or glare disrupt nearby plant activity.

You can't see the LINDE SERVICE that stands behind every UNIONMELT installation to assure its efficient and profitable operation. Only LINDE can give you this unique combination of research, engineering, and over 40 years of welding know-how that is helping LINDE customers save money and improve production. And only LINDE can give you the accumulated benefits of more than 18 continuous years of development, field testing, and improvement in the field of submerged melt welding where it pioneered.

LINDE's Service Engineers will gladly help you design a UNIONMELT installation to meet your exact requirements. They will also be available to help you when a tough production problem comes up. Call your nearest LINDE representative today.

Linde
TRADE-MARK

LINDE AIR PRODUCTS COMPANY
A Division of Union Carbide and Carbon Corporation
30 East 42nd Street UCC New York 17, N. Y.
Offices in Other Principal Cities
In Canada: DOMINION OXYGEN COMPANY, LIMITED, Toronto

The terms "Linde" and "Unionmelt" are registered trade-marks of Union Carbide and Carbon Corporation.

AT THE FRONTIERS OF PROGRESS YOU'LL FIND

AN AIR REDUCTION PRODUCT

For Welding and Cutting . . .

NATIONAL CARBIDE

in the red drum

HIGHEST QUALITY
DUST FREE

Write for the name and address of the NATIONAL CARBIDE supplier nearest you.

National Carbide Company

GENERAL OFFICES: 60 EAST 42ND STREET, NEW YORK 17, N. Y.

A DIVISION OF AIR REDUCTION COMPANY, INCORPORATED

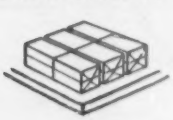
"WE CUT REWORKS 94% with DryRod Electrode Oven!"

When 1 out of 3 welded hydraulic fittings were rejected at a leading Milwaukee machinery plant*, engineers blamed *moist electrodes.* Installing a low-cost DryRod Electrode Oven to store all unpackaged low-hydrogen rods, this company got *immediate* improvement . . . faster, better welds . . . few rejects. Their welding engineer said, *"DryRod successfully solved our welding porosity problem. With it we've been able to cut our reworks from 30 pieces to less than 2 per hundred!"*

Get your money's worth

You pay a premium for stainless steel, low-hydrogen, and other mineral-coated electrodes. Preserve that "baked-in" quality with DryRod Electrode Oven. Ask your welding supply dealer, or write direct for free folder.

Cut costs 4 ways with DryRod Method!



1 Store sealed cartons in warm, dry place.

2 Place unpackaged electrodes in DryRod Oven and withdraw as needed.

3 Locate DryRod as close to welding operations as possible.

4 For flexible, large-volume storage, stack ovens with compact DryRod Stands.

DryRod DIVISION OF **Phoenix Products Co.**
4715 N. 27TH ST., MILWAUKEE 16, WIS.

Argon Plant At Houston Supplies the South

THE Houston Oxygen Co., argon plant, the only one in the South, works in connection with its liquid oxygen and nitrogen production. The argon from the new million dollar plant in Houston is used to inert-gas weld metals all over the south and also to fill light bulbs, fluorescent and neon tubes.

The Houston Oxygen Co's production process involves filtering air and compressing it through five stages to 2,350 psi. As it passes through an expansion engine, the air is reduced in temperature to 170 deg C. The air then goes into a huge, towering rectification column where it is liquified and then broken down. Components are removed at various levels of the column.

The crude argon gas goes through the tower a second time before it is poured into a giant balloon suspended from the three story ceiling. From there is funneled to the purifying plant.

The first two refining process remove all but a trace of oxygen. The final step send the impure argon into a furnace where hydrogen is introduced to combine with the oxygen into water which can then be drained off. This process leaves the argon 99.92% pure.

The argon produced at Houston is shipped under 2,400 psi pressure in cylinders to all points of the country and to many Central and South American localities.

* * *

STEEL DATES—1900: *As a result of research beginning in 1892, A. J. Rossi of Niagara Falls, N. Y., used titanium commercially as an alloying element in steel.*

Pot Magnets

Two new workholding magnets have round and square shapes. Model MCR, the round model, has a diameter of 4 in. and a pull of 275 lb with an air gap of 0.005 in. Model MCQ is a cube 3¾ in. on each side and has a pull of 375 lb with air gap of 0.005 in. Both models are provided with tapped holes for securing to fixtures or other structures.

Suggested uses include holding plates at proper angles for welding, holding templates to metal plates, holding track and radius centers for flame-cutting jobs and lifting large sheets that might otherwise be marred or scratched.

ARONSON MACHINE CO., Arcade, N. Y.

* * *

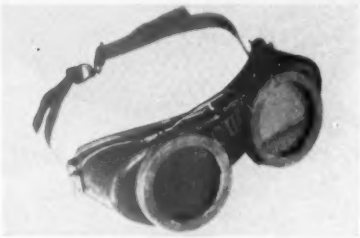
Cast Iron Rod

THE new EutecRod 143FC is an oxy-acetylene welding rod for cast iron. Available in flux coated or bare condition, it contains special alloying elements that provide greater strength and density in the weld metal.

The new rod does not require fusion temperatures in the cast iron base metal, heats of 1,450-1,650 F being sufficient. The square rods come in ⅜, ¼, 3/16 and ⅛ in. sizes.

EUTECTIC WELDING ALLOYS CORP., 172nd St. and Northern Blvd., Dept. P, Flushing, N. Y.

* * *



Non-Fogging Goggles

A STEADY stream of air prevents steaming and fogging in the new Oxweld No. 24 coverall goggles. There are 16 vents behind the lens retaining rings to permit continuous air circulation across the inside surfaces of the lenses.

The goggles will fit over any spectacles and are adjustable to broad or narrow noses so that each wearer can look through the center of the lenses. The frames are made out of flame-resistant, high-impact nylon. A metal bar across the top of the eyecups holds them rigid for raising or lowering with one hand. They are green and come equipped with standard "AA" type lenses.

LINDE AIR PRODUCTS CO., 30 E. 42nd St., New York City 17.

Why You Should Use...
PAGE Automatic Welding Wire

• PAGE Automatic Welding Wire is made to rigid specifications which provide consistent characteristics for smooth flow of metal during continuous or intermittent welding. There are many analyses for a wide variety of uses.

for INERT GAS Welding

PAGE Stainless Steel Wire is precision thread-wound on 25-lb. non-returnable convenient reels which fit popular arc welding machines. Six Page-Allegheny grades; wire diameters: .035", .045", .0625".

for SUBMERGED ARC Welding

PAGE stainless, low alloy, and carbon steel wire in layer-wound coils, in 22" or 24" mill coils, or on 200-lb. returnable steel reels. Wire diameters from 1/32" to 5/16"; copper coated if desired.

ACCO

Write to our Monessen, Pennsylvania office for Bulletin DH-402

PAGE STEEL AND WIRE DIVISION
AMERICAN CHAIN & CABLE

Monessen, Pa., Atlanta, Chicago, Denver, Detroit, Los Angeles, New York, Philadelphia, Portland, San Francisco, Bridgeport, Conn.

PAGE Welding Electrodes AND Rods

Fingertip heat control

right at the work-with the P&H Welding Twins

equipped with Dial-lectric Control

Dial-lectric Control is an exclusive P&H feature that helps you weld faster, easier, better — at less cost!

P&H AC WELDER

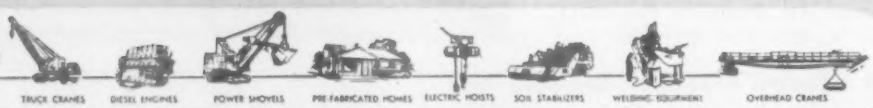
As easy as tuning your radio — just turn the radio-type knob of the Dial-lectric Instantaneous Remote Control (or step on a foot treadle), to adjust heat accurately. Easy, quick-start arc. No hard-working cranks to turn. No moving parts to cause delays or maintenance expense. Sizes up to 625 amps., NEMA rated. Connectable to 220 and 440 volts.

P&H DC RECTIFIER WELDER

Also equipped with hand-or foot-operated Dial-lectric Control, to give the welder fingertip heat control at the work. No hard-working cranks to turn. No moving parts to wear out. Saves on power costs under load — and during idle and no-load periods. Protects the primary input line against unbalanced conditions. Three sizes, 200, 300, and 500 amps., NEMA rated.

P&H WELDING DIVISION
HARNISCHFEGER CORPORATION
4513 WEST NATIONAL AVENUE • MILWAUKEE 46, WISCONSIN

the P&H *Line*



2404

Dependence Day—Pro

Dear Sir:

Congratulations on your fine editorial in the July issue of THE WELDING ENGINEERING, entitled "Dependence Day Declaration." Please quote us on reprints.

Yours very truly,
Keith S. Wood, president
Wood Brothers Mfg. Co.
Oregon, Ill.

* * *

Dear Sir:

Hurrah for our side. Your editorial in the July issue, "Dependence Day Declaration" is wonderful. We need more people like you to speak out and sound the warning of the pitfalls of "Security Mindedness". Let's have more editorials like this one.

I just returned from a trip up north to Portland, Seattle and Spokane. There is a lot of welding going on in that area, particularly in the shipyards.

Sincerely,
Glenn E. Smith
Tweco Products Co.
San Jose, Calif.

* * *

—And Con

Dear Sir:

I was very much interested in your editorial titled "Dependence Day Declaration." However, I feel that you have only scratched the surface. Why are employees interested in security? There must be a reason, and there is; in fact, there are more than one.

It is obvious that a hungry person thinks of food, while one who has finished a hearty meal doesn't. A wealthy person doesn't think of security (he has enough) while a poor person worries about what will happen when he will be too old to work.

. . . . instead of condemning security (someone) should work out a way so that people won't be so fearful of not having it. If you don't believe me, I'd suggest you take a job (perhaps as a coal miner—they're well paid), live and work at it for a year, so that you could see my viewpoint. I do know that if I had $1,000,000 or even $50,000 I wouldn't be interested in security.

Very truly yours,
Leon Wolk
R. F. D. No. 3
Rockville, Conn.

* * *

Our Mid-June Issue

Dear Sir:

Thank you for the many favors and courtesies extended to us relative to our distributor sales school last week. We received the 30 copies of your Mid-June issue and made very good use of them. Please accept our sincere thanks and appreciation.

Yours very truly,
F. L. Blodgett,
Ass't General Sales Manager
Alloy Rods Co.
York, Pa.

* * *

He Liked April Cover

Dear Sir:

I just had occasion to see your April cover with the beautiful reproduction of our 2,000,000-volt tank welding scene.

Would there be any possibility of securing three etch proofs of the entire cover for purposes of framing and hanging in our lobby for the edification of the numerous visitors who tour our plant? These would also be useful for other display purposes, such as on plant bulletin boards because of their interest to all employees.

Sincerely yours.
David Goodman, Manager,
News Bureau
X-Ray Department
General Electric Co.
Milwaukee, Wis.

* * *

Argentine Reader

Dear Sir:

May I inform you that I am a regular reader of your magazine. I find it very interesting as it keeps me informed about all that is new in the welding field.

Sincerely yours,
Carlos A. Weil
Ingeniero Civil,
Mecanico y Naval
Buenos Aires, Argentina

* * *

Reprints Wanted

Dear Sir:

Would you be kind enough to send us several reprints of the article "Soldering on a Production Basis" appearing in your June issue.

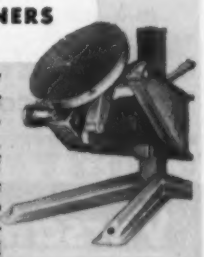
Sincerely yours,
W. Ballard Dumper,
L. B. Allen Co., Inc.
Chicago, Ill.

P&H
Welding Equipment
speeds production
schedules, cuts costs

P&H
LOW-HYDROGEN
ELECTRODES

13 types for high-strength welds on problem steels, steel castings, nickel-alloy steels, chrome-moly steels, .40 carbon castings, high-hardenable steels, aircraft and similar steels.

P&H
POSITIONERS



Position heavy weldments for economical down-hand welding. Complete range of sizes to handle work from 2500 to 36,000 lbs. — remote-control and hand-operated models.

P&H WN-301
Engine-Driven
DC ARC WELDER

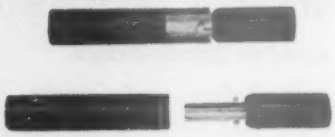
2- or 4-Wheel Mountings

Portable. Equipped with Dial-electric Control, for fingertip heat control at the work — gives you faster, better welding. Runs at only 1750 rpm. Welding service range, 60-375 amps, NEMA rated.

Ask your P&H representative or distributor for complete information, or write for free bulletins.

P&H WELDING DIVISION
HARNISCHFEGER CORPORATION
4513 W. National Ave., Milwaukee 46, Wis.
2494A

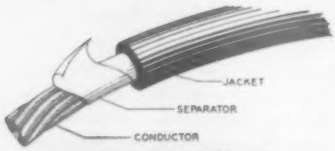
Help yourself to savings!
with these DALWELD accessories



DALWELD
CABLE CONNECTORS

Save time, power, cable — heaviest duty cable connector on the market — made exclusively for heavy duty service, rough and tough handling, high currents — preferred by shipyards, steel mills, refineries, etc. — instantly connected or disconnected with a quarter-twist — cannot be accidentally pulled apart.

1/0 - 2/0.....400 amp.....$4.50
3/0 - 4/0.....600 amp.....$5.50



DALWELD
WELDING CABLE

You never hooked up with a more flexible cable — or a cable that could take more punishment — it is specially made for rugged service conditions — has a jacket of Neoprene compound that resists abrasion, heat, oils, acids and alkalies — it's really tough, fully guaranteed — and priced to please!

Prices per Thousand Feet

#2	$220.00	#1	$255.00
#1/0	$315.00	#2/0	$395.00
#3/0	$475.00	#4/0	$585.00

Freight allowed on 200 lbs. or more. Cable packed in 250-ft. coils or 1000-ft. reels.

WRITE TODAY FOR COMPLETE PRICE INFORMATION
Dealer inquiries invited

DALWELD COMPANY, 1 Bertel Avenue, Mount Vernon, N. Y.

Versatility Cuts Costs!

(1) (2)

WELDING—(1) Individual Mixer and Tip Assemblies or (2) Universal Mixer with Swaged Tips. Sizes 00 to 10 (drill sizes 76 to 30).

K-G's AP Welding & Cutting COMBINATION

(1) (2)

HEATING—(1) Acetylene or (2) Propane. 12", 18" or 24". Propane tips interchangeable.

ALL PURPOSE. Takes a wide variety of tips. Excellent for brazing, welding, heating, cutting. Rugged, efficient, dependable.

CUTTING—75° or 90° head. Cutting range: ⅛" to 6".

SEE YOUR K-G DISTRIBUTOR
or
write for
AP CATALOG SHEET

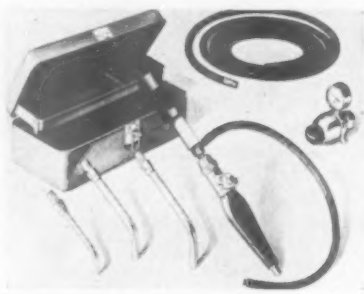
The K-G Equipment Co. (Inc.)
Unit of Air Products, Inc.
Dept. A, P.O. Box 538, Allentown, Pa.

Class B Ignitron

A NEW Class B ignitron tube has been added to the National line of industrial tubes. Labeled the NL-5551, it is a metal, water-cooled, mercury pool tube designed for resistance welder control and other a-c control applications. Its rating is about equal to a 300 amp magnetic contractor.

The tube is claimed to be a strong, compact structure made of seam-welded stainless steel. The mercury pool cathode permits the tube to handle extremely high currents on an intermittent basis.

NATIONAL ELECTRONICS, INC., Geneva, Ill.



Refrigerator Kit

A "HALIDE Leak Detector Stem" is included in a new Prest-O-Lite refrigeration and air-conditioning repair kit. Three torch stems are provided to give the right flame for open-flame soldering, heating and and bending of small tubing. The interchangeable stems fit into the No. 401 handle.

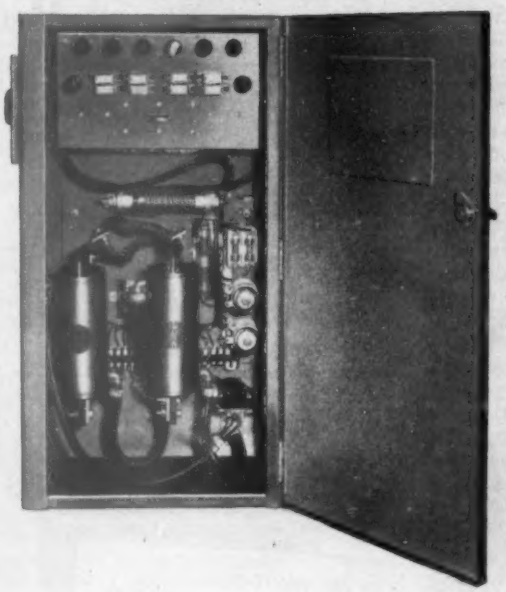
A built-in pilot flame control on the handle saves time and fuel during intermittent work. Also included is the R-411B acetylene regulator and a 12½-ft length of 3/16-in. acetylene supply hose. The entire kit comes in a steel carrying case.

The leak detector assures accurate and positive identification of refrigerant gas leaks of such gases as F-11, F-12, F-21, F-113, F-114, and Carrene, also methyl bromide (fumigant) vapors in air, where such concentrations are less than 10%.

LINDE AIR PRODUCTS CO., 30 East 42nd St., New York City 17.

WHETHER YOU'RE WELDING 2 PIECES OR 199...

G-E Resistance Welding Controls Make Faster, More Accurate Welds



TYPICAL PANEL is neat, compact. Advanced circuit design is result of long experience in control design and manufacture. Spot-welding panel above is non-synchronous NEMA Type N2.

The occasion probably will never arise when you'll have to weld 199 pieces of metal together, but you could—with G-E controls.

SINCE 1888, when Elihu Thomson developed the first resistance welding transformer, G-E engineers have been designing welding controls for all production requirements. Whether your operation demands speed or accuracy or both, specify G-E control. G.E.'s complete line includes synchronous-precision, nonsynchronous, three-phase, and all special-purpose accessories for all welders.

FOR MORE INFORMATION, contact your nearby G-E Apparatus Sales Office or welding machine manufacturer or his agent, or write:

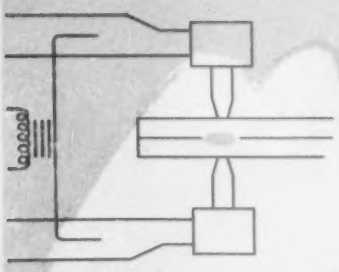
Section A785-7,
General Electric Company
Schenectady 5, New York

Please send the following bulletins:

☐ **GEA-5816,** "The Story of Resistance Welding": theory behind the process and complete description of all G.E.'s controls.
☐ **GEA-5945,** "Synchronous-Precision Control."

NAME ..... **TITLE** .....
COMPANY .....
ADDRESS .....
CITY ..... **STATE** .....

GENERAL ELECTRIC



Here's a Money-Saving TIP

. . . for cleaner, sounder welds—less downtime—increased production

Use AMPCO WELD® Spot-welding Tips

Get tough with your spot-welding costs. Reduce downtime, get longer runs — use Ampco Weld spot-welding tips. These electrodes have unusual resistance to mushrooming and wear. They have high electrical conductivity, too — they stay cooler, don't stick to the work.

That's why Ampco Weld resistance-welding tips require far fewer dressings, stay on the job longer, save you money because of fewer shutdowns.

Ampco-weld tips are part of an extensive line of Ampco resistance-welding products. All meet, and most exceed, RWMA specifications. And free, expert Ampco engineering service is available if you want or need it. Order Ampco tips today — and step up your production for lower costs.

Write for latest catalog.

®Reg. U. S. Pat. Off.

RWE-8

AMPCO

Ampco Metal, Inc.
Dept. WE-9
Milwaukee 46, Wisconsin

West Coast Plant • Burbank, California

Cincinnati Welding Shop Marks 7 Years Growth

STARTING in 1946 with one helper, Albert Reckman (above photo), president of A. R. Welding and Fabricating Co., Cincinnati, now has a million dollar a year volume and 35 employees. The young industrial firm also has about a dozen employees in outside plants on a subcontract basis.

Newest moneymaker for the firm is the "PreCaster," which precasts such hard-to-make concrete shapes as lintels, highway guard rail posts, parking lot markers, joists and other shapes that will "strip" through a straight box. The "PreCaster" weighs 4,620 lb, is 11½ ft long and 6½ ft high. Mr. Reckman is responsible for the redesign of the machine that made for efficient production. He is now one of the principal owners and a director of PreCaster Inc. and has exclusive rights for its manufacture.

The present bustling plant was long a dream in Mr. Reckman's mind as he worked for 11 years in the engineering department of the Ivorydale plant of Procter & Gamble Co. He developed his skills in general mechanical work, welding and drafting and finally in 1946 made the plunge.

The company's service to industry includes welding and metal fabrication in steel from 3/16 in. on up. About 80% of the work is on a contract basis with the customer's blueprints.

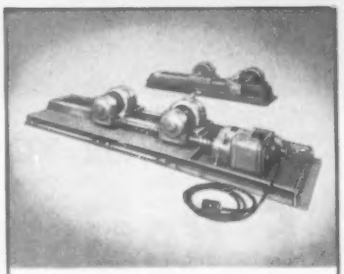
Facilities available to the customer include redesign, welding, fabricating, stress relieving, machining, grinding and sandblasting and painting. Special equipment includes a yard crane, a big cast iron table measuring 96 by 264 in. and flat to within 0.005 in. tolerance, portable grinders, a 12-ft bending roll and heavy capacity trucks for fast delivery of finished products to customers. Shop and yard area total 16,840 sq ft. but an expansion is planned.

President Reckman's top assistants are vice-president R. A. Riebel and works manager, Gene Moore.

REED ENGINEERING CO.

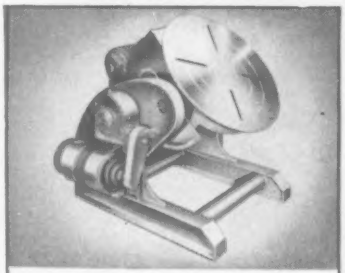
Modern Metalworking Equipment

- BENDING ROLLS
- TURNING ROLLS
- AUTOMATIC WELDING FIXTURES



REED PORTABLE TURNING ROLLS

- ★ In 5 models; capacities up to 75 tons
- ★ For hand or automatic welding, finishing operations on tanks up to 14 ft. diam.
- ★ Reversible, variable speed adjustment
- ★ Rugged, all-steel construction
- ★ Built-in silent worm gear drive



REED WELDING POSITIONER

- ★ Machined face with cast-in "T" slots
- ★ Machine Tool accuracy
- ★ 10-to-1 speed variation
- ★ Ball bearing work table mounting
- ★ 1000, 2500 lb. models, hand or power tilting
- ★ Rotating ground connection

WE INVITE YOU . . . to write us for specifications, prices, list of REED users near you. No obligation. Just write on your letterhead.

REED ENGINEERING CO.
1007 W. FAIRVIEW, CARTHAGE, MISSOURI

Plastic Packages Clothe Safety Gear

THE E. D. Bullard Co. of San Francisco has begun packaging its line of Fibreglas and aluminum hats and caps, sandblast helmets, safety belts, hoods and firehats in polyethylene plastic bags. Each bag has a round sealed bottom and open top. Equipment is simply slipped into the bag and the bag folded under.

There are several advantages to the new methods, says E. W. Bullard, president. The safety equipment remains in clean and sanitary condition even if stored on factory shelves for a long time.

Caps and hats in use are often turned in for cleaning and new liners. The company safety department can then replace the worn out parts, wash out the hats and package them for return in the bags which are reusable.

Each package bears the name of the company, its trademark and descriptive copy in green. Bags, artwork and printing were supplied by Mehl Mfg. Co., a division of Sydney-Thomas Corp., Cincinati.

* * *

Distributors Picked for New Welder

ABSCO Welding Supplies, 582 Mateo St., Los Angeles, and Welders Supply Co., 1741 Fourth Ave. South, Seattle, Wash., have been appointed distributors in their areas for the Glenn constant-voltage welder. The announcement was made by George G. Glenn, president of Glenn Co., 3134 East 10th St., Oakland 1, Calif., manufacturers of the new welder for submerged arc and inert gas automatic welding and automatic stud welding.

* * *

Stainless Slurry Tank Has All-Welded Seams

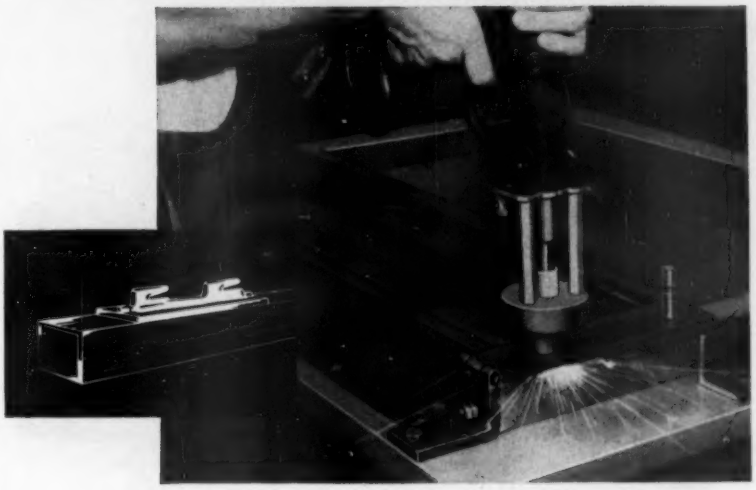
THE industrial division of Bethlehem-Pacific's San Francisco Shipyard has just completed fabrication of one of the largest all-stainless slurry tanks ever built in the Bay area. It will be used by the chemical division of Standard Oil Co. of California's Richmond refinery.

The tank has an overall length of 33 ft 9½-in. and a diameter of 14 ft 9 in. including the stiffening rings which encircle the outside. It is supported in its upright operating position by a stainless steel base ring attached to the outside of the lower head.

The tank was filled with 130 tons of water to test its welded seams. Weldors were elated to see that not a single leak was found in the 4,000 ft of welded joints.

improved stud welding
through **KSM** engineering

ENGLANDER COMPANY SAVES $10,000 PER YEAR...



with change-over to KSM ARC WELDED STUDS

Large production schedules keep the **Englander Company, Inc.,** Chicago, one of the largest manufacturer of metal beds and bedding products, constantly alert for cost-cutting manufacturing methods. This continuing search by **Englander** recently solved a difficult assembly problem when they put stud welding in their assembly line.

KSM Arc Welded Studs provided the fast, low-cost answer to the problem of securely fastening a spring support to hollow metal bedposts without marring the inside surface.

By changing to KSM Studs, drilling, supporting, peening and hand-filing were eliminated. Estimated savings produced by the change-over to KSM Arc Welded Studs, according to the **Englander Company,** amount to $10,000 on a yearly basis.

How The Problem Was Solved

A simple jig locates two KSM welding studs on each post within a tolerance of .02 inches and positions them perpendicularly. Welds are made instantaneously by merely pulling the welding gun trigger. The precision-centered solid flux, a feature originated by KSM, assures welds that withstand the required 30 foot-pound torque. The spring support is placed on the studs and securely fastened with two nuts.

KSM Arc Welded Studs make the tough, heavy-duty fastening jobs easy and fastening costs lower. Get the benefits of KSM engineering for your stud welding problems. Write KSM Products, Inc., Merchantville, N. J.

KSM
STUD WELDING

How to produce
strong, uniform welds
and save time doing it

Mine cars made of light weight low alloy, high strength steels mean bigger loads at savings in operating costs for mine owners. Strong, sound welds—able to resist the impact of loading, and the abrasion of filling and dumping also mean savings for the fabricator as well as additional savings in maintenance for the mine operator.

Because Arcos Low Hydrogen Electrodes can produce sound welds on a job like this, they can do the same thing for you on every *application* involving low alloy, high tensile steels. Whatever your requirements, there's an electrode to meet them. Rigid quality controls in manufacture assure you weld metal consistently high in quality and performance.

ARCOS GRADE	A. W. S. SPEC.
Tensilend 70	E7016
Tensilend 100	E10016
Tensilend 120	E12015
Manganend 1M	E9015
Manganend 2M	E10015
Nickend 2	E8015
Chromend 1M	E8015
Chromend 2M	E9015

Write today for "The ABC's of Welding High Tensile Steels".

Arcos Corporation, 1500 South 50th Street, Philadelphia 43, Pennsylvania

WELD WITH ARCOS
LOW HYDROGEN ELECTRODES

All-State Distributors Pass 700 in Number

THE total number of distributors stocking and servicing All-State welding alloys and fluxes now exceeds 700, according to R. H. Mandel, vice-president, All-State Welding Alloys Co., Inc., White Plains, N.Y. The 700 mark was passed when the following eight welding supply companies were accepted into the company's sales network that covers nearly all of the free world. They are: Lake Welding Supply Co., Muskegon, Mich.; Lincoln Welding Supply Co., Lincoln, Nebr.; Suburban Welders Supply Co., Inc., Newtonville, Mass.; McEvoy Supplies, Inc., Charleston, S. C.; Tennessee Welding Supply Co., Knoxville, Tenn.; California Welding Gases, Salinas, Calif.; Illinois-Missouri Welding Products Co., Jacksonville, Ill.; Lee Equipment Co., Detroit 4, Mich.

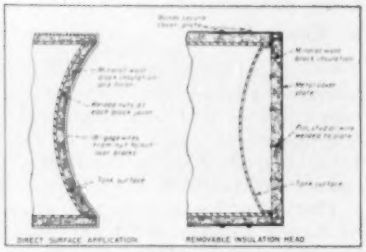
* * *

Cobalt-60 Handling Taught in 2-Week Course

THIS fall Technical Operation, Inc., Arlington, Mass., will offer the first in a series of two-weeks training programs in Cobalt-60 radiography for industry. The curriculum will cover health physics, the handling of Cobalt 60 and other gamma ray sources and the practical and theoretical aspects of industrial radiography.

About half the time will be taken in lectures, demonstrations and question-and-answer periods. The other half of the courses will include actual practice including experiments in shielding, radiation measurement and taking of radiographs. Further details may be secured from the company.

"COME, NOW, MORTIMER, HE ISN'T THAT BAD!"



Welded Nuts Aid Insulation of Concave Tank Ends

SECURING insulation to concave ends of horizontal tanks is not a simple matter of banding as with convex ends and cylindrical tank surfaces. Each section of mineral wool block insulation on a concave surface must be individually held in position.

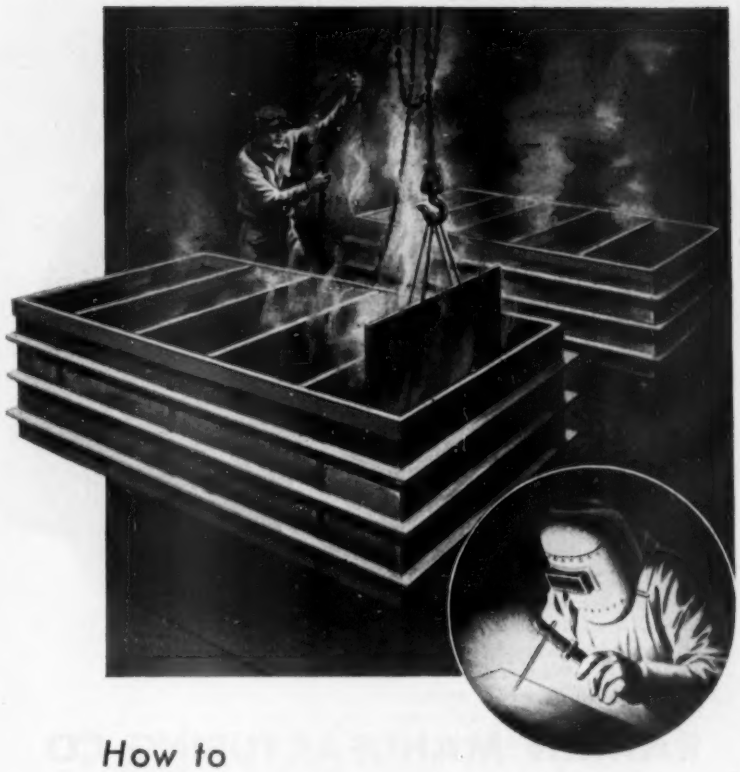
An effective method of attachment on such tank ends employs nuts welded to the surface as anchors for tie wires passing from nut to nut over each section of insulation. A removable-head construction is useful on tanks where the concave ends cannot be welded or where periodic internal inspection of the tank is simplified by easy removal and replacement of the insulation.

Welded edgewise to the concave metal surface, ¼-in. nuts are spaced between each horizontal row of block insulation so that at least two vertical rows of nuts cross each insulating section. For example, application of 6 by 18 in. mineral wool block insulation requires welded nuts at 6-in. vertical intervals and not less than 9-in. horizontal intervals. The 18-gage tie wires are passed through the nuts and tightened over each section of insulation as it is placed in position. The final step is the application of appropriate finishing materials such as mineral wool insulating and finishing cements followed by a waterproof coating as specified. The same installation steps apply to the use of welded rods and studs as well as to nuts.

* * *

Plasteel Products To Sell Nelson Studs

THE Plasteel Products Corp., Washington, Pa., will supply Nelson "Rivweld" studs direct to purchasers and applicators of its protected steel roofing and siding materials. It is the first producer of protected metal roofing and siding to carry a regular stock of Nelson studs for sale to purchasers of its products, according to Leonard C. Barr, vice-president and general sales manager of the Nelson Stud Welding Div., of Gregory Industries, Inc.



How to
***tame corrosion** fast and*
effectively on welded joints

Chemical tanks and equipment must have more than the proverbial nine lives to withstand incessant corrosive attack.

Proper plate material and good joint design are basic. The choice of the right electrode in some cases may be relatively easy—but always highly important. In other cases, where the corrosive action is intensified by heat and perhaps pressure, the proper balance of the chemical, physical and metallurgical properties in the weld metal will be critical.

For every *stainless* job, whether it be relatively simple or critical . . . there's an Arcos quality-controlled electrode that will pay handsome dividends in sound trouble-free *weld metal.* Send for a free copy "What Electrode Would You Use?"

Arcos Corporation, 1500 South 50th St.
Philadelphia 43, Pennsylvania

WELD WITH ARCOS
STAINLESS ELECTRODES

EXTRA WEAR

WITH RANITE B-X

RANITE B-X is priced to give you the most economical maintenance cost. 3/16", ¼", and 5/16" is only .60c per lb. in three box lots. Other sizes slightly higher.

RANITE B-X has an exceptionally high deposition rate. This means less welding time, less heat induction, (especially good for manganese), less parent metal dilution, and less cooling distortion.

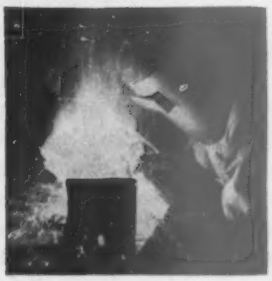
RANITE B-X contains the ingredients you want for abrasive and impact wear.

Ask your local distributor about RANITE, or let us put you in touch with the closest source of supply—We would like a chance to show you what REAL service means.

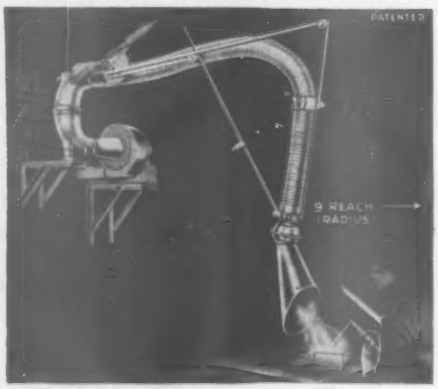
RANKIN MANUFACTURING CO.

3072 West Pico Blvd., Los Angeles 6, California

RUEMELIN Fume Collectors



Welding without ventilation. Note smoke and gas clouds.



(Right) Welding with Ruemelin Fume Collector.

REMOVE WELDING FUMES at the Source!

Ruemelin Fume Collectors remove smoke, gas and welding heat. Keep the shop air clean. Efficient and practical. Maximum coverage in welding areas. Your welders work better with this equipment in use. Write for bulletin 37-E describing the new spring-loaded counterbalance mechanism.

Long reach collector extends working range of hood to 15 ft. or 18 ft. operating radius. Double swivel permits hood to work in 360° circle for full coverage.

RUEMELIN MFG. CO.

Manufacturers and Engineers SAND BLAST AND DUST COLLECTING EQUIPMENT

3880 NORTH PALMER STREET • MILWAUKEE 12, WISCONSIN, U. S. A.

A 5896-½R

Iowa Blacksmiths Meet at Spirit Lake

Two full days of meetings and entertainment marked the 45th annual convention of the Iowa Blacksmiths & Welders Association at Spirit Lake, Iowa, June 26-27. The board of directors met June 28.

The welcoming address was given by Grand Commander E. J. Biasi, Iowa Knights Templar, with response by George Tonneson, Dike, Ia. Leo LaFountain, of the Spirit Lake Chamber of Commerce spoke at the first meeting and gave each member a gold-plated fish hook and a guest card so that delegates wouldn't have to pay at parking meters.

Officials present included Harold Fieblekorn, national president; Richard Klapper, vice-president of the Wisconsin association; Ed Silvers, president of the Minnesota association; Mr. Sands, past-president of the Minnesota association and William Allen, mayor of Ames, Ia.

An awakening interest in the state and national associations of blacksmiths was noted in the meeting, especially among the younger members. An outgrowth of this interest was the appointment of a committee to devise a recognition symbol for shops fronts of member firms.

A ladies auxiliary was formed with the following officers: Mrs. Harold Fieblekorn, president; Mrs. Willam Dahms, vice-president; Mrs. Richard Boyler, secretary and Mrs. H. A. Porter, treasurer.

Saturday night's big attraction was a banquet at which Omaha Welding Supply provided the public address system and gave each blacksmith's wife a corsage of three orchids. All 128 guests sat at a big horseshoe-shaped table. Mason Dixon, program manager for radio station KICD, Spencer, Ia. was toastmaster.

New officers for the coming year are George Tonneson, Dike, Ia., president, Richard Boyler, Davenport, Ia., vice-president and W. F. Allbee, Rolf, Ia.

Representatives of some 40 manufacturers and distributors of welding equipment were present including Marquette Mfg. Co., Barkley Mfg. Co., Omaha Wheel and Rim, Des Moines Wheel and Rim, Des Moines Iron, Shaffer & Dierstein, Baum Iron, Sioux City Steel, Omaha Welding Co., Herschel Mfg. Co., Missouri Valley Steel Co., Williams Hardware and Balbach Co.

* * *

STEEL DATES—1918: *The first patents were issued for molybdenum structural steels after many years of experiment. Molybdenum alloy steels became one of the standard steels in 1926.*

Welded Bridge Chosen For Iowa's Cedar River

Low bid on a recent competition for a welded highway bridge on U. S. Highway 30 near Cedar Rapids, Ia., went to the Iowa Bridge Co., Des Moines. Winning bid was $523,708.02 for a bridge of welded girder construction.

Two of the five bidders involved submitted figures for both welded and riveted designs. In both cases the riveted bid was higher, about $30,000, and indicated an increased consumption of 108,000 lb more of steel.

The bridge was designed by Howard, Needles, Tammen & Bergendoff, consulting engineers of Kansas City, Mo. The steel was fabricated by the Allied Structural Steel Companies. Spanning the Cedar River, it is 1,134 ft long and consists of two 117-ft end spans and six intermediate 150-ft spans all built as one continuous unit. It carries a 28-ft concrete roadway with 1 ft 9 in. concrete curbs and steel handrails. The girders are constant depth sections 7 ft 10 in. deep made of three plate sections, all shop welded, according to the Lincoln Electric Co. The 2-in. thick girder flange sections are tapered from 28-in. wide over piers to 18-in. at splices.

The nearly completed bridge was built by the Iowa State Highway Commission for which F. R. White was chief engineer until Oct., 1952, when he retired. His successor is E. F. Koch. E. W. Blumenschein is the commission's bridge engineer.

* * *

Bonding Seminar Set for Oct. 6

The first comparison seminar ever held on organic bonding versus brazing and welding will be held Oct. 6 at Eutectic Welding Alloys Corp., Flushing, N. Y. R. D. Wasserman, Eutectic president, says that requests for enrollment in the seminar are coming in rapidly, indicating a widespread interest in the comparative advantages of the bonding methods. Information can be obtained from the Eutectic home office at 172nd St. and Northern Blvd., Flushing 58, N. Y.

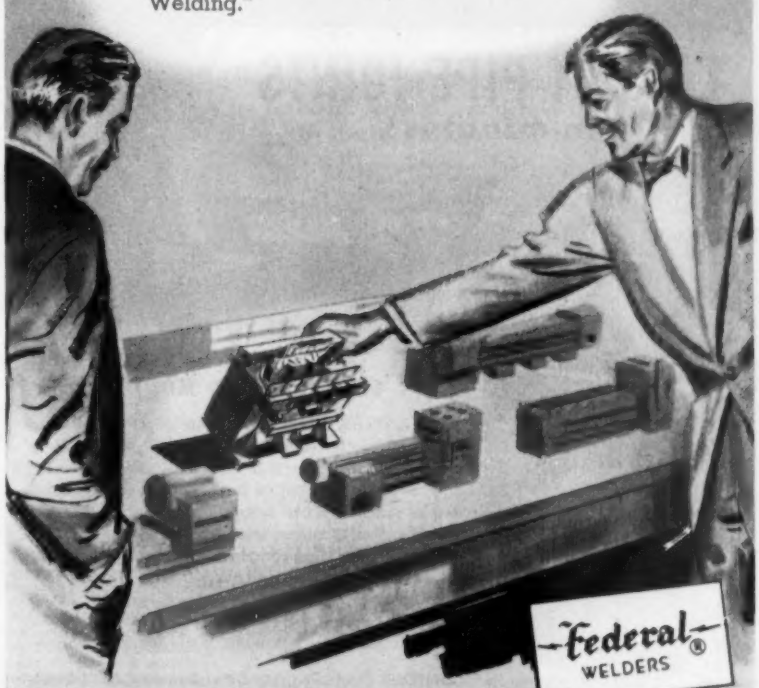
AUTOMATION with FEDERAL WELDERS CAN CUT COSTS!

Automation is a word invented by production-minded people to describe the automatic handling of material in process, the combining of two or more operations into a single operation to reduce costs and speed production.

Perhaps one of the greatest advances of automation has been made in the resistance welder field where Federal has taken the lead in designing and building welders that have successfully combined forming, handling and/or assembly with welding.

This advancement has, in many production shops, actually eliminated the "welding bay," and made welding an all-important station in the production line.

If welding is part of your operation you should get the facts of cost-cutting automation in resistance welding, and to make sure of getting the complete story consult Federal — "First in Resistance Welding."



Federal® WELDERS

THE FEDERAL MACHINE & WELDER COMPANY

WARREN, OHIO

Warco® PRESSES

FOUR HEADED Meco TORCH...

QUADRUPLES CUTTING USES.

Four different angle heads give the MECO Super Cutmaster the amazing flexibility to handle any cutting job. This four-in-one torch is used by leading American industries for heaviest hand cutting and general service. Preheat flame stability assured by spring tension control valves. Easy-to-open cutting valve is adjusted by touch to provide correct amount of oxygen for the job.

Various mixer designs use either pressure or low pressure Acetylene, low pressure City Gas, Butane, Propane, or Hydrogen.

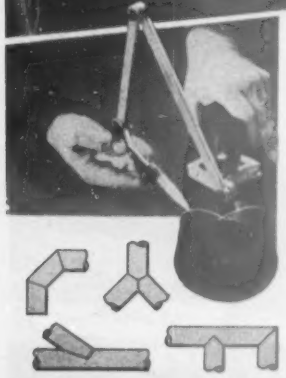
The tougher the job—the sooner you'll specify Super Cutmaster to your MECO dealer.

Meco

Modern Engineering CO., Inc.

3411 PINE BLVD. ST. LOUIS 3, MO.

LAY OUT PIPE JOINTS
in minutes!



SAVE TIME AND MONEY!

A SMOOTH SWING of the Contour Marker's soapstone point and you're ready to cut! It's easy and *absolutely accurate* because there is an angle dial calibrated in both degrees and pitch. Any of the pipe joint angles shown can be marked off in minutes. And you save "man hours" as well as oxygen and acetylene gas because "cut and try" methods are completely eliminated. Two sizes are available complete with adapter for marking structural steel. Standard, for pipes from 1½" to 18" dia.; Jumbo, for pipes from 16" to 48" dia. Instruction book included. Belt case available. Write for information

CONTOUR MARKER CORPORATION OF CALIFORNIA
1843 E. Compton Blvd., Compton, California • NEwmark 1-9474

THE CONTOUR MARKER

Welding of Shafts Widespread in Navy

FOR the last 12 years it has been common practice in the Navy to weld-repair broken or cracked ship propulsion shafts. Many were as large as 16-in. in diameter. Repairs are made by the manual arc method on carbon and low alloy steels ranging in tensile strength up to 85,000 psi.

Adoption of this method was the result of exhaustive tests and experiments by the Navy. The standard procedure governing welding of propellor shafts also includes complete preheat and postheat techniques.

A reasonable estimate is that at least 50% of Naval shafts are salvaged by this method. This results in considerable savings in costs, but more important, helps maintain vessels at sea. When a ship comes into a repair yard and an 18-inch forging is unavailable and no shafts are in stock, a long delay could occur. With welding men on the job, many combat vessels have been put back to sea with a minimum delay.

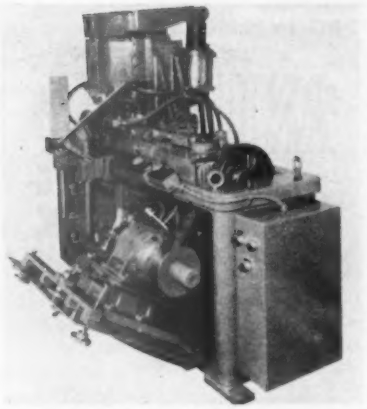
American Bureau of Shipping had proved such processes to be practical but prior to World War II many damaged Navy shafts were removed and discarded to the junk pile.

* * *

Ventilator Producer Changes Firm Name

THE Flexaust Company is the new name of The American Ventilating Hose Co., a division of Callahan Zinc-Lead Co., Inc. The company wants the new name to better identify itself with its products: Flexaust, a spiral-wire reinforced hose; Portovent, a hose with excellent lengthwise compressibility and Bloflex, a collapsible hose.

"THESE ARE OLE'S. HE HANDLES ALL OUR BIG WELDING JOBS."



New Gearing Speeds Welder Follow-Up

BETTER quality welds are being made on a new flash butt welder (above) that has been fitted with double-enveloping worm gearing. Inertia forces have been considerably reduced in the gearing to the offset cam, according to Precision Welder & Flexopress Corp., Cincinnati.

The new gear is characterized by having greater contact per tooth and more teeth in contact, enabling the use of smaller gears to handle the same amount of power. In addition, the large number of teeth in contact provides an action smoother than that of a hydraulic system, says Cone-Drive Gears, division of Michigan Tool Co., Detroit.

The new flash welder incorporates a standard speed reducer, eliminating large bulky gear trains with their high inertia forces. Gears not only get moving faster but also slow down quicker when the power is removed. The welder shown above was tooled to make automobile garnish moldings. The front panel of the welder is open to show the accessibility of the motor drive and the brake. The reducer has a center distance of only 3 in. to transmit the power from a 1-hp motor.

* * *

Oxweld Tells Story in Color Film

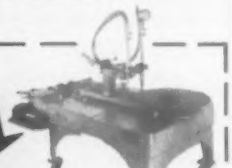
RAILS of Tomorrow", a new 16 mm. sound and color film, is available from Oxweld Railroad Service Co., 30 E. 42nd St., New York City 17. The 14-minute film was made by the Spokane, Portland and Seattle Railway Co. It shows the various steps of "Ribbonrail" welding service and the welding and laying of 6 miles of continuous rail. Also shown is the unusual transportation method used by the railroad to move 1,500 ft lengths of rail. Copies of the film are available for showing to railroad engineers.

YOU CAN TEAM UP
A GB SILVER BRAZING
ALLOY AND FLUX
TO GET
PERFECT RESULTS!
NO MATTER HOW YOU HEAT...
The method of heating for low temperature brazing is a decided factor in the selection of the right silver solder and flux. Specify GB and you're right, because you'll get a combination that was made to work right!
OXY-ACETYLENE
INDUCTION
AIR-GAS
SALT BATH
BUNSEN BURNER
OXY-HYDROGEN
OXY-PROPANE
OXY-CITY GAS
CARBON TONGS
RESISTANCE
FURNACE BRAZING
CHARCOAL
BLOW PIPE
GB's line of six standard silver solders offers a range which meets standard production methods. When special solders are required, GB's Technical Service Division offers assistance which is based on experience in alloying and refining precious metals that goes back more than 80 years.
GB Standard Silver Solders
GB No. 50 Silver Solder, melting range 1160-1175°F
GB No. 50N Silver Solder, melting range 1240-1260°F
GB No. 45 Silver Solder, melting range 1125-1145°F
GB No. 41 Silver Solder, melting range 1125-1160°F
GB No. 35 Silver Solder, melting range 1130-1270°F
GB No. 31 Silver Solder, melting range 1130-1300°F
GB FLUXES
The physical properties and appearance of a brazed joint are controlled to a large degree by the flux which is used. For this reason it will pay you to team-up GB Flux with GB Silver Solder — they were developed to produce maximum results when used together.
GB DATA BOOK
Here's real factual data on all of the important phases of low temperature brazing. You can get a free copy from your GB Distributor — Write us and a copy will be forwarded to you.
GOLDSMITH BROS. SMELTING AND REFINING CO.
1304 W. 59th Street, Chicago 36, Illinois
Suppliers of Precious Metals to Industry Since 1867

flame-machine gears and sprockets with fast, accurate Cogmatic method

WHY put up with cast iron sprockets . . . why use expensive machine-cutting methods . . . when at low cost you can produce *hardened steel* sprockets, to accuracies of .015" with Cogmatic flame cutter. Offers real opportunities for building profitable business supplying gears and sprockets to industry. Makes big savings for any shop producing their own. With moderate investment, Cogmatic method enables you to:

- **Machine as much tooth metal per hour as with *three* conventional gear cutting machines.**
- **Automatically cut over 300 different shapes and sizes of teeth . . . 5 to 200 teeth per wheel.**
- **Deep case-harden with water quench while you cut.**
- **Machine 3 at a time up to 15" diameter . . . one at a time, up to 108" diameter.**



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FOR MORE INFORMATION

Name _____

Address _____

City _____ State _____

Type of shop _____

C-6

COGMATIC CO.
1330 NORTH FRANKLIN PLACE
MILWAUKEE • WISCONSIN

Goodrich Welding Moves to Hudsonville, Mich.

BETTER service for its customers is the reason the Goodrich Welding Equipment Corp. is moving its entire operation from Reed City, Mich., to Hudsonville, Mich., where a new factory is being built (above).

Superior rail and highway connections, plus the fact that it is nearer both customers and suppliers figured in the decision to move to Hudsonville. The Goodrich factory has been at Reed City since Aug. 1950.

The Hudsonville factory will have 19,980 sq ft of manufacturing and 2,320 ft of office space, 1/6 more than the former plant. All the Reed City equipment is being moved.

Products made by Goodrich include resistance welders, transformers, automatic production machines, jigs, fixtures and welded fabrications. Except for the transformers, all products are custom made.

* * *

National Cylinder Gas Appoints New Dealer

ALLEGHENY Welding Supplies, 2215 Ninth Ave., Altoona, Pa., has been named a dealer for the complete line of National Cylinder Gas Co. products, gases, oxyacetylene welding and cutting equipment, arc welders, electrodes and NCG medical gases and oxygen therapy apparatus.

* * *

Two New Offices for P. R. Mallory

MORE Midwest service is being offered by P. R. Mallory & Co., Inc., Indianapolis, with two new offices at Dayton, O. and Milwaukee. In charge of the Dayton office at 44 South Ludlow St., is R. H. Andrew. O. V. Miller is manager of the Milwaukee branch at 526 Empire Bldg., 710 No. Plankinton Ave.

* * *

New Thor Office

A NEW Thor sales and service factory branch office was recently opened in Newark, N. J., at 1 Tichenor Lane and Parkhurst St. It is the 21st in the Thor domestic chain and will offer complete service on both air and electric power tools.

NO INJURIOUS FUMES . . .

"ANTI-BORAX"

No. 2 BRAZING FLUX

For Brass, Bronze, Copper, Steel, Malleable Iron, etc. Causes the bronze to penetrate deeper into the joint — making a stronger union than is possible with other fluxes. High efficiency makes it more economical to use. Melting point 300°.

ALSO

1—Cast Iron Welding Flux
3—Brass, Bronze Welding Flux
4—Flux for Bronze Welding Cast Iron
5—Extra Quality Aluminum Flux
7—Steel Flux
8—Aluminum Flux
9—Stainless Steel Flux
11—Tinning Compound
12—Burnt Cast Iron Welding Flux
13—Brazing Flux for Extruded Bronzes
14—Special Brazing Flux for Aluminum Bronze, Everdur, and all Silicon Bronzes
15—Special Flux for Magnesium Alloys, Dow Metal, etc.
16—Silver Solder Paste Flux

FOR THE BEST JOB AT LEAST COST

Weldors can save more money and get a better job on production work, making special tools, and repair work with the right Anti-Borax product—**order by number.** Send for **free sample** and descriptive circular.

ANTI-BORAX COMPOUND CO., Inc.
FORT WAYNE, INDIANA

WAGNER
ELECTRODE HOLDERS

The perfect teammate for WAGNER GROUND CLAMPS

RESIST ARC HEAT

Fiber Glass Tip Insulation operates near 6,000° heat.

COOLER

Patented channel construction flushes heat radiation twice as fast.

FULL CURRENT DELIVERED

Wagnerloy Construction results in high conductivity, longer service.

WAGNER MFG. CO.
350 W. 1st SOUTH ST.
JACKSON, MISSOURI

Weld with Wagner

Preheat Calculator Re-Issued by Lincoln

THE Lincoln Electric Co. has re-issued its widely used "Welding Preheat and Interpass Temperature Calculator." In accordance with latest welding practices, all information on the calculator is arranged in a slide-rule sequence for quick and easy location.

To operate the calculator, the analysis of the steel and its thickness are entered on the instrument and the amount of preheat read off as indicated. The metal thicknesses covered range from ½ to 10 in. The calculators are available from The Lincoln Electric Co., 22801 St. Clair, Cleveland 17, at 50c each in the U.S.A. and 75c in other countries.

* * *

Four New Dealers Sell Alloy Rods

ALLOY Rods Co., York, Pa., added the following four distributors to its national organization for selling the complete line of Alloys Rods electrodes: Rayno Distributors, Inc., Brooklyn, N. Y.; Virginia Welding Supply Co., Charleston, W. Va.; Hobart Brothers Sales & Service, Minneapolis, Minn. and Cottet's Welding Supply Co., Syracuse, N. Y.

* * *

Low-Flying Salesman Wears Safety Belt

GENE CONNOR, Spokane, Wash., is a fast-moving sales representative for Miller Electric Mfg. Co., Appleton, Wis. On a recent trip to the home plant, Miller employees noticed a safety belt fitted to the driver's seat of Gene's car. When asked about it, he explained, "When I go from Spokane to Seattle, I go from Spokane to Seattle!"

* * *

Hartford Statler Hotel To Have Glass Walls

THE new 455-room, 16-story Hotel Statler now rising in Hartford, Conn., will have walls of glass, aluminum and porcelain-enamel instead of masonry. It will be the first of its type in the world. It will resemble the United Nations building and the Lever House in New York City.

* * *

Welding Rod Poster

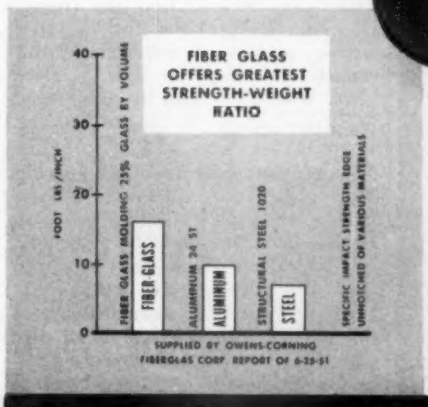
AN attractive four-color poster showing the advantages of "Zirtung" tungsten electrodes is available from the Tungsten and Chemical Div., Sylvania Electric Products, Inc., Towanda, Pa. The poster can be hung on a wall or is self-supporting on a counter. Size of the poster is 16½ by 20 in.

THE NEW SAF-I-WELD FIBER-Glass WELDING HELMET

CUT YOUR HELMET COSTS IN HALF

- Double Life—Greater Strength
- Rugged one piece Seamless Shell
- Lightweight—Comfortable
- No Warping from Heat or Moisture
- Not affected by Acids, Alkalis or Solvents
- Will retain original shape permanently
- Highly Resilient—Will not split, crack or deform
- Attractive green color, easily cleaned
- Meets A.S.A. code for electrical conductivity
- Comfortable headgear design with even weight distribution
- Patented position hinge locks helmet in "raised" or working position
- Easily adjusted, fit any head size

SAF-I-WELD Welding Lenses



• SAF-I-WELD welding lenses offer sharp, clear definition without any color distortion. Finest optical qualities and unexcelled shade characteristics are made possible by precision methods of individual grinding and polishing. All lenses are identified with shade number markings and are packaged in individual envelopes. They meet all Federal Specifications for acetylene and electric welding. A size for all standard helmets and goggles. A complete line of Cover Plates and Lenses also available.

Write for Literature and Prices

UNITED STATES SAFETY SERVICE CO.
KANSAS CITY 6, MISSOURI BRANCHES IN PRINCIPAL INDUSTRIAL CITIES
In Canada PARMELEE, LTD. Toronto — Montreal

ALLOYS All-State FLUXES

HOW TO DO IT

Condensed Versions of ALL an Operator Needs to Know to Swing to

EASIER WAYS

of Welding, Brazing, Soldering, Tinning, Cutting

FREE!!

Which one do you want?

All-State Welding Alloys Co., Inc., White Plains, N. Y.

I've checked the "How to Use and Apply" folder I want.

■ DOC ALLOYS KIT — Generous sampler of 11 torch applied ALL-STATE alloys, 8 fluxes, 1 galvanizing powder.

■ ALUMINUM and ALUMINUM ALLOYS — World's most complete line of aluminum alloys and fluxes — ALL-STATE.

■ COPPER and COPPER-BEARING ALLOYS — 10 ALL-STATE alloys and fluxes for work on copper and copper-bearing alloys.

■ STEEL — 13 ALL-STATE alloys and fluxes for work on STEEL.

Name_____

Address_____

Company_____

PAUL J. LEONARD has been elected president of Wagner Mfg. Co., Jackson, Mo. One of the founders of the company, he was formerly vice-president and managing director. He has helped develop the whole Wagner line including electrode holders, ground clamps, cable connectors, lugs and fittings. LOYD L. MCCAIN continues with the company as vice-president and sales manager.

* * *

WILLIAM J. "BILL" SPILLMAN has been appointed field sales representative for western California and Arizona by Miller Electric Mfg. Co., Appleton, Wis. He worked as a weldor in several plants until 1945 when he opened his own welding shop in Paragould, Ark. Moving to Arizona in 1949 he became a salesman for Arizona Welding Equipment Co. He will have his office in Long Beach, Calif.

* * *

PAUL F. VOIGT, JR., has been named special representative and merchandising consultant for The American Welding and Mfg. Co., Warren, O. He formerly served in that capacity with Solar Aircraft Co., San Diego. He is a veteran of the steel industry having worked as manager of the stainless steel division of U. S. Steel Corp. from 1936 until his retirement in 1952.

* * *

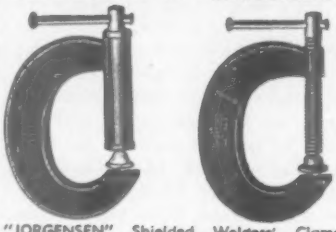
New appointments recently made for Traclerlab, Inc., include the following: L. KEITH ELROD will take charge of the new Atlanta office. WILLIAM A. MCCARTHY is in charge at Cleveland. JOHN H. KLINGER was named Los Angeles sales representative. WILLIAM F. BUTLER was appointed district manager at Washington, D. C.

* * *

C. B. SMYTHE, president of The Thew Shovel Co., Lorain, O., has been elected to the board of director of Gregory Industries, Inc.

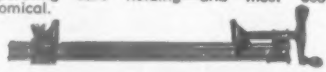
TRADE MARK "Jorgensen" REG. U.S. PAT. OFF. and "Pony"

CLAMPS for WELDERS:



"JORGENSEN" Shielded Welders' Clamps eliminate damage from "spatter", and are low-priced. "Regular" "C" clamps are available too, if preferred.

"PONY" Clamp Fixtures make ideal bar clamps on any length of black pipe. Fast operating—sure holding—and most economical.



"JORGENSEN" Steel Bar Clamps are designed for the severe requirements of welding service; exclusive "multiple disc clutch" makes for instant adjustment—economy. The trade-mark "JORGENSEN" or "PONY" on your clamps is assurance of utmost satisfaction in service—specify and insist upon them from your supplier. FREE CATALOG ON REQUEST.

ADJUSTABLE CLAMP COMPANY

"The Clamp Folks"

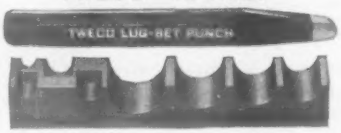
426 N. Ashland Ave., Chicago 22, Ill.

TWECOLUGS

FOR WELDING AND POWER CABLE

New copper solder type TWECOLUGS are especially designed for making cable connections; they have large diameter stud holes with ample wing nut clearance. 4 sizes for welding cables 6 through 4/0. 4 sizes for power cables 14 through 4.

TWECO "LUG-SET"



An eight-saddle back-up block and a special round-end punch for mechanically attaching Copper TWECOLUGS and "Lug-Set" Splicers. The punch impacts the lug barrel for a quick connection with maximum strength and conductivity. All you need is a hammer.

Top and Bottom View of Lugs Attached

TWECOLUGS—mechanical type, are available for attaching to cable with a wrench.

See Your Welding Supply Distributor

Tweco PRODUCTS COMPANY

BOSTON AT MOSLEY WICHITA 1, KANSAS

TWECO PRODUCTS

Townsend

Feld

M. W. TOWNSEND has been appointed assistant to the president of Handy & Harman. He has been sales manager. PAUL G. FELD will take over as manager of sales. Both men will be located at the New York offices.

* * *

RUSSELL K. SODERQUIST has been appointed general manager of Industrial Tubes, Inc., Geneva, Ill., manufacturer of industrial electronic tubes. Mr. Soderquist graduated in electrical engineering from Iowa State University and began his engineering career at Continental Electric Co., Geneva. He has also worked for Ross Mfg. Co., Burlington, Ia., and National Electronics, Inc., Geneva

* * *

The following men were present at the manufacturer's relations committee meeting of the National Welding Supply Association in Cleveland, June 26: R. P. TARBELL, chairman, Scott-Tarbell, Inc.; WILLIAM METZGER, Compressed Gases of Ohio, Inc,; R. C. WALDIE, Williams & Co., Inc.; J. M. ROBINSON, Robinson Welding Supply Co.; E. C. CALUWAERT, O.-K.I. Welding Supplies; M. C. POWAR, Welding & Cutting Supply Co.; WILLIAM A. RICE, Virginia Welding Supply Co., ROBERT C. FERNLEY, secretary, NWSA.

* * *

CHARLES L. DOERRER has been named district sales manager of the east-central region of Stulz-Sickles Co., Newark, N. J. Headquartered in Johnstown, Pa., he will cover western Pennsylvania, Maryland, and parts of Virginia and West Virginia.

* * *

JOHN P. ANDREWS has joined the Lukenweld division of Lukens Steel Co., Coatesville, Pa., as a sales engineer. Before joining Lukenweld he was connected with a major process equipment company for 13 years. His work will be with the new line of low-cost solvent extraction "package-plants." Henry F. Peters has been named manager of the technical service department of Lukens Steel Co. He joined the Lukens research department as technical assistant in 1949.

announcing the South's first

ARGON GAS PLANT

to serve the U.S.

For welding and commercial uses you can now order any quantity of Argon Gas from our new plant for quick delivery anywhere. This inert gas is 99.92% pure, exceeding maximum specifications.

Lincoln "Inertarc" machines for welding aluminum, magnesium, titanium, copper and carbon steel are now available.

Houston OXYGEN COMPANY

3602 West 11th • TWinoaks 3317 • Houston, Texas

if YOU had to wear them you'd choose EYEGARDS

The Only Goggles With The 10-Way Ventilation

BEST THING NEXT TO YOUR EYES

● EYEGARDS assure workers the very finest in eye protection and comfort — yet THEY ARE PRICED SURPRISINGLY LOW! Compare these outstanding features! — built-in comfort because the super-light plastic "form-fits" the face — greater protection because of exceptional high impact resistance — extra ventilation through three large vents at side of cup and seven additional vents around the lenses — cool and completely fog free. Get the "inside story" today. Write for free catalog.

● Illustrated is the No. 335 Welder's Coverspec Goggles. A wide range of other types are available at savings.

AMERICAN INDUSTRIAL SAFETY EQUIPMENT COMPANY

3503 LAKESIDE AVENUE CLEVELAND 14, OHIO

DIVISION OF THE BURDETT OXYGEN COMPANY, Cleveland, Ohio

CLEANING BEFORE SPOT WELDING ALUMINUM

Improve quality of welds!
Increase number of spot welds before tip cleaning!
Prolong life of electrode tips!
Eliminate tedious, expensive mechanical cleaning!

DIVERSEY Pre-Welding Treatment for Aluminum

DIVERSEY no. 36 CLEANER

DIVERSEY no. 514 DEOXIDIZER

If you are looking for improved spot welds, increased production and lower costs, it will pay you to investigate the famous Diversey Pre-Welding Treatment for aluminum now . . . it's practical, proved superior, easy and surprisingly economical to use!

Diversey Pre-Welding Treatment is possible because of two outstanding Diversey developments . . . No. 36 cleaner for removing identification markings, grease and soil; No. 514 deoxidizer for removing oxide and heat scale!

A Diversey D-Man will be happy to show you the advantages of Diversey Pre-Welding Treatment for aluminum! No obligation! Write today! Complete information is available!

LOOK FOR DIVERSEY IN CLEVELAND
National Metal Exposition and Congress
BOOTH 2008 • OCTOBER 19-23, 1953

THE DIVERSEY CORPORATION
Metal Industries Department
1820 Roscoe Street • Chicago 13, Illinois
In Canada: The Diversey Corporation (Canada) Ltd.
Lakeshore Road, East Credit, Ontario

FRANK IAPALUCCI has been appointed welding engineer for Baldwin-Lima-Hamilton Corp. A student at Wayne University and Chrysler Institute of Engineering, he is a member of the Ordnance Advisory Committee serving in an advisory job on the welding of armor plate. He has worked for Murray W. Sales Co., General Motors Corp., Gar Wood Industries, Ford Motor Co., Detrex Corp., Palmer-Bee Co. and Chrysler Corp.

* * *

THOMAS J. GRIFFIN has taken over A. G. Bissell's place as the new head civilian at the Welding, Forging and Casting Branch, Bureau of Ships, U. S. Navy. He was formerly superintendent of welding and fabrication at Koppers Co., Bartlett and Haywood Div., Baltimore. He has more than 28 years of welding experience to his credit. A 20-year member of AWS he is a member of the committee on welding, American Bureau of Shipping. His work is widely known in connection with Navy's atomic energy program.

* * *

E. C. CLARK has been appointed director of operations for Air Reduction Sales Co. He has been with Airco 24 years and was recently assistant director of the research and engineering department. He has held various positions including superintendencies of the Houston and Louisville oxygen plants, and manager of all Airco gas plants. L. B. DOBBINS, works manager of the Airco liquid oxygen plant at Butler, Pa., has been appointed manager of plant engineering, New York.

* * *

G. LYNN COANE has been appointed sales engineer in the commercial weldment department of Baldwin-Lima-Hamilton Corp. He was formerly with U. S. Army Ordnance as inspector of heavy forgings, weldments and castings. Prior to that work he was a sales engineer with Welding Engineers, Inc., Norristown, Pa.

* * *

DR. ROBERT F. MEHL, a top authority on metals research, has been appointed Dean of Graduate Studies at Carnegie Institute of Technology, Pittsburgh.

* * *

ROY RUMBAUGH has been named director of sales engineering for Klem Chemicals, Inc., Dearborn, Mich.

TILLMAN
Gloves—Garments

WELDORS BUY FROM YOUR DEALER

ASK FOR OUR NEW CATALOG

BRAZILIAN DEERSKIN
THE "STAY SOFT" LEATHER GLOVES AND MITTENS

TILLMAN PRODUCTS
John Tillman & Co.
Long Beach, Calif.

GRAND WELDERS' GROUND CLAMPS

- EXTRA STRONG
- FAST ACTION
- POSITIVE CONTACT
- HOLDS ANY SURFACE
- SPATTER PROOFED

QLW SERIES
Grand quick setting Ground Clamps of NACO No. 6 Super Steel are first choice with welders. Available in 3 popular sizes.
2-QLW 200 Amps 1¾" Max. Opening
4-QLW 400 Amps 3⅜" Max. Opening
6-QLW 600 Amps 5⅛" Max. Opening

Famous GRAND "C" Clamps
Alloy Steel (Stronger than forged) Spatter-Proofed Screws, Deep Throat—Replaceable Swivels

LIGHT SERVICE SERIES	MEDIUM SERVICE SERIES	HEAVY SERVICE SERIES
L SERIES	ASM SERIES	ASH SERIES
8 SIZES 2" TO 12"	7 SIZES 4" TO 18"	8 SIZES ¾" TO 12½"

Stocked and Distributed by
UNITED STATES STEEL SUPPLY CO.
GRAND SPECIALTIES CO.
Manufacturers Since 1921
3101 WEST GRAND AVE., CHICAGO 22, ILL.

RICHARD F. PUFFER has been named assistant general sales manager of The American Brass Co., Waterbury, Conn. ALLEN W. ROCKWELL has been made manager of the Waterbury branch and ROBERT R. VANCE will succeed Mr. Rockwell as works manager of the Waterbury Branch.

* * *

WILLIAM L. MANLEY has been named assistant director of sales of the general machinery division at Allis-Chalmers Mfg. Co. For the last several years he has been special assistant to C. W. Schweers, vice president and director of sales for the division.

* * *

CURTIS L. BATES has joined Ryan Aeronautical Co., San Diego, Calif., as assistant director of engineering. He was with Northrop Aircraft, Inc., in top engineering posts for more than 10 years.

* * *

ROGER N. PERRY, JR., has recently returned to Norton Co.'s public relations department, following two years active duty with the Navy. He is now responsible for the department's technical service section, which includes all contacts with the technical press.

* * *

JOHN DOWNES has been appointed assistant to the president of the Milwaukee School of Engineering, Milwaukee, Wis. He is assigned to the Fiftieth Anniversary Development Program.

* * *

JOHN C. TARVIN has been appointed field sales manager, industrial products, and RAYMOND F. FARLEY western regional supervisor, industrial products, for S. C. Johnson & Son, Inc., Racine, Wis.

* * *

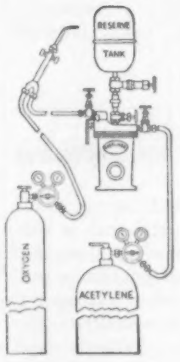
ALEXANDER GOBUS, director of the non-destructive testing department, North American Philips Co., Inc., represented the ASTM at the meeting of Commission Five of the International Institute of Welding in Copenhagen, Denmark, July 6-11.

Died . . .

VICTOR W. PETERSON, 61, chairman of the board of the Hannifin Corp., Chicago manufacturer of hydraulic and pneumatic equipment, died July 1 at his Indiana farm. He was president and board chairman from 1928 to 1947 and was chairman until his death. He resided in Evanston, Ill.

HERE ARE SAVINGS!

FOR MEN WHO USE TORCH BRAZING IN PRODUCTION WITH BRONZE OR SILVER ALLOY BRAZING ROD



A GASFLUXER can be installed in your production line in less than 2 minutes, without disturbing any standard set-up. Works equally well with acetylene, city gas or other fuel gas. Uses standard torches and tips.

The GASFLUX Brazing Process is now making these savings:

Steel Tube Furniture: Leaves finished work so clean that it can be painted, sprayed or dipped without any flux removal whatsoever, thereby realizing a considerable saving in cost.

Refrigeration Unit Brazing: Reduces leakers by more than 60 per cent. Less cleaning necessary after brazing. Lower cost per joint through savings of both flux and alloy.

Tube-Within-Tube Joints: Much greater penetration results in a considerable decrease in leakers. Prevents formation of black oxide scale.

Metal Cabinets: Better penetration of brazing alloy results in much fewer rejects. Grinding time shortened. About 25% improvement in production.

A request on company letterhead will bring details of procedures used in any of these applications.

The Gasflux Company

198 Wayne Street — Mansfield, Ohio

They're Ready to Work for YOU!

YOUR MANGANAL DISTRIBUTOR

Look to your Manganal Distributor with confidence on all your worn equipment problems. He's a seasoned expert and has a keen interest in getting your equipment back to work fast.

MANGANAL

U.S. Patents 1,876,738—1,947,167—2,021,945

11%-13½% MANGANESE-NICKEL STEEL

Manganal is the time-saver and money-saver that rebuilds and repairs worn equipment faster, more economically. Prove it to yourself on that next job. You'll be glad you did.

- APPLICATOR BARS • WEDGE BARS
- SPECIAL SHAPE APPLICATOR BARS
- HOT ROLLED PLATES • SPECIAL TITE-KOTE AND BARE WELDING ELECTRODES
- SEACO HARD SURFACING WELDING ELECTRODES

Send for FREE helpful tips on speedy and economical repair of worn equipment. Also FREE Manganal Wall Chart.

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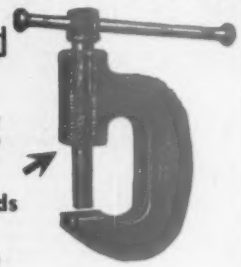

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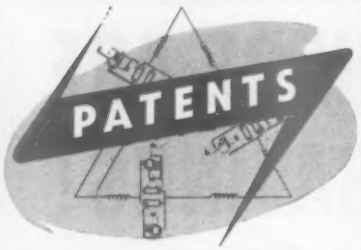
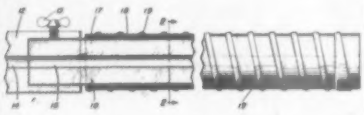


Underwater Cutting Electrode

2,640,136. BELA RONAY, Annapolis, Md. Filed Jan. 30, 1947. Granted May 26, 1953.



This patent covers an electrode for arc cutting of metal that is submerged. It comprises an elongated main body of siliconized silicon carbide and a metallic sheath of appreciable thickness surrounding the main body of the electrode and closely fitted to it. The sheath extends lengthwise of the electrode body for a considerable part of the length. An electrical connecting means is attached to the electrode substantially at one end to make contact with the metal sheath. The sheath constitutes a low resistance path for the current from the point of attachment of the electrical connecting means to at least substantially the working end of the electrode.

* * *

Stud Welding Method

2,638,525. ALBERT M. CANDY, La Grange, Ill. Assigned by mesne assignments to National Cylinder Gas Co., Chicago. Filed Oct. 30, 1945. Granted May 12, 1953.

This patented method of arc welding a stud to a plate comprises placing a ferrous stud provided with an aluminum element against a metal part. The aluminum element extends beyond the end of the stud. An electrical circuit is completed between the stud and the part through the aluminum element to form an arc upon melting of the aluminum. The thickness and spacing of the aluminum element with respect to the stud and the amount of aluminum making up the element is so selected and correlated as to position the stud initially at the proper distance from the part to form a welding arc. When the element melts a gap is formed for the arc. It also provides a flux to protect the molten metal formed by the arc from oxidation. It forces the end of the stud into contact with the part thereby to interrupt the arc and form a weld.

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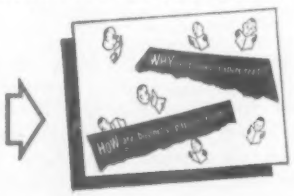

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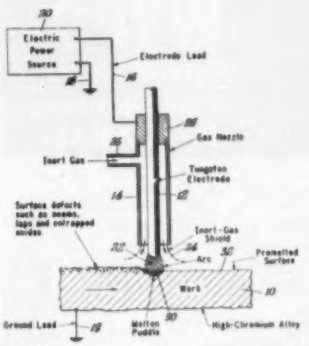
Inert-Gas Arc Scarfing

2,640,792. WILLIAM O. BINDER, Niagara Falls, N. Y. Assigned to Union Carbide and Carbon Corp. Filed Jan. 29, 1951. Granted June 2, 1953.



This patent refers to a process for removing surface and subsurface defects (including laps and seams due to metal splashing) from ingots of high-alloy refractory metals. This process is carried out prior to hot rolling in order to insure satisfactory surface quality of the resulting product without the loss of any of the refractory alloy metal and without any change in the composition of the base metal. The ingot is positioned so that the surface to be conditioned is uppermost and about level. An arc is struck between the surface of the ingot and a refractory metal electrode made of tungsten. Continuously shielding the arc and the surrounding parts of the electrode and ingot is a circular stream of monatomic gas (argon and helium in combination). The gas is discharged from a nozzle surrounding the electrode at a flow rate of 25 to 40 cu ft per hour. The end of the gas nozzle is positioned as closely as possible to the ingot surface (not more than ⅜ in.). The gas shielded arc is moved continuously along the surface at about 10 ipm while maintaining the critical spacing between the nozzle and ingot surface. The arc is supplied with a current of 400-450 amp. The ingot metal is deeply melted under the arc to a depth of the order of about ¼ in. progressively and without interruption along the path of movement of the arc. Oxides and other foreign matter are floated out, leaving a defect-free bead of homogeneous metal with the same composition as that of the base metal. By repeating such steps adjacent beads are formed having laterally overlapping sides without crevices or cracks there between.

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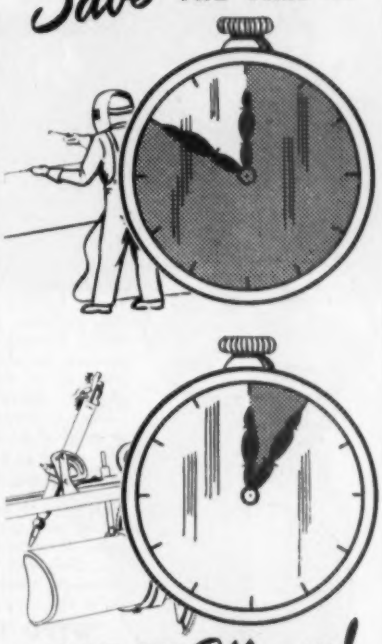

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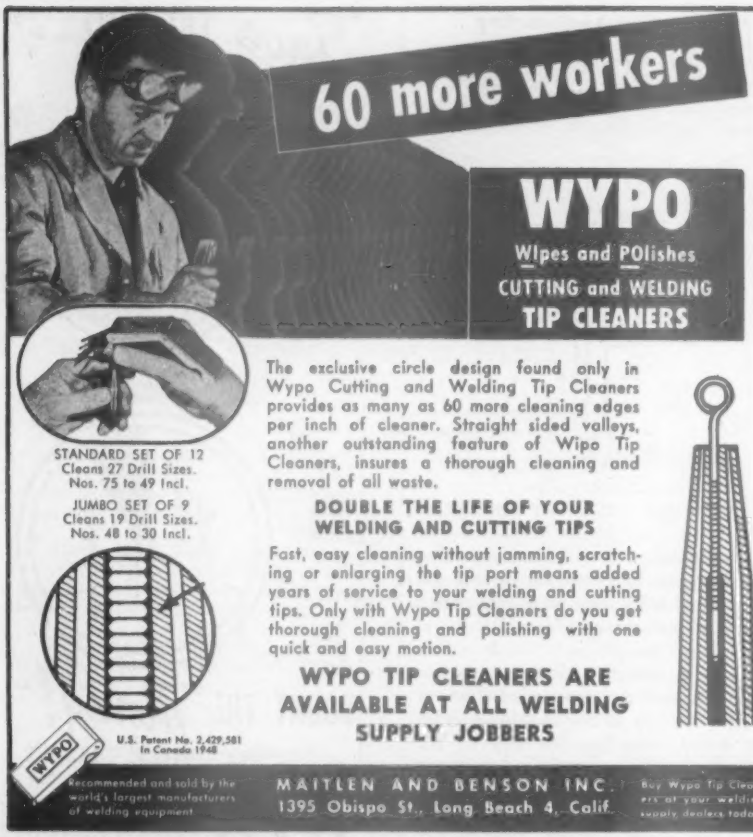
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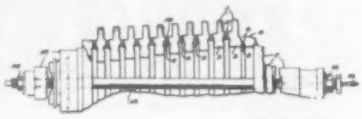
2,637,521. LEONARD R. CONSTANTINE, Greensburg, CHARLES T. EVANS, JR., Delmont, and EDWARD S. DENNISON, Hempfield Township, Westmoreland County, Pa. Assigned to Elliot Co., Jeannette, Pa. Filed March 1, 1949. Granted May 5, 1953.

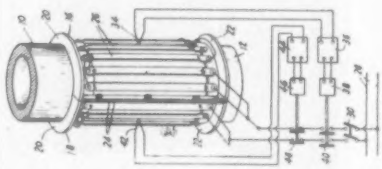


This newly patented method of welding together a pair of gas turbine rotor circular discs made of a brittle alloy having high strength at gas turbine operating temperatures comprises placing the discs side by side with an inwardly tapered circular groove between them closed at its inner side by a back-up ring. A root pass is made in the groove around the ring with a weld metal that is of different composition and materially more ductile than the disc metal. Succeeding passes are made with a weld metal of substantially the same composition as the disc metal. Thereby incipient cracks between the weld and the back-up ring will be restricted to the ductile metal. Then the ductile metal and the underlying back-up ring metal are bored out.

* * *

Welding Dissimilar Metals

2,639,363. PAUL M. BRISTER, Madison, N. J. and LAMBERT F. KOOISTRA, Akron, O. Assigned to The Babcock & Wilcox Co., New York City. Filed June 15, 1950. Granted May 19, 1953.



This patent refers to a welded joint between tubular conduits of dissimilar metals which have different thermal coefficients of expansion. Electrical resistance heating elements are used to uniformly heat the welded joint. The heaters are uniformly spaced apart circumferentially completely around the tubular conduit members and are arranged to radiantly heat the parts of the tubes adjoining the weld. Means are provided for connecting the alternate heating elements around the entire circumference of the joint in a first electric circuit and the heating elements intermediate such alternate heaters in a second electric circuit in parallel with the first electric circuit.

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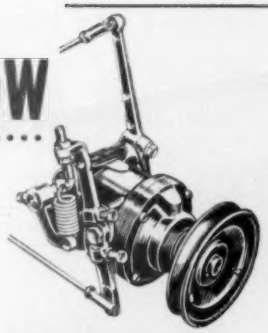

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Acetylene Torch

2,638,972. WARREN A. SPARKS, Long Beach, Calif. Assigned to John M. HENRY, Los Angeles. Filed Jan. 28, 1950. Granted May 19, 1953.

This patent covers a torch comprising a body, a burner tube, a trigger, a flint and striker, and a spring pressing the flint against the striker. Another spring connects the trigger and the striker and is operable to snap the striker against the flint to ignite gas in the burner tube. The body has a longitudinal bore. A piston is slidable in the bore and is operably associated with the trigger. The piston is provided with a longitudinal gas passage. A conduit supplies acetylene to the bore. A valve seat is in the bore. A valve is associated with the valve seat and has a stem. The stem is engageable by the piston upon actuation of the trigger to unseat the valve. A spring normally presses the valve against the seat. A second valve seat in the bore has an opening communicating with the first valve seat. A second valve is associated with the second valve seat and has a stem engageable upon further movement of the piston by the first valve to unseat the second valve. A second spring normally presses the second valve toward the closed position. A conduit supplies oxygen to the bore on the inlet side of the second valve. On actuation of this trigger the first valve is opened to first admit acetylene to the burner tube. The flint is next sparked to ignite the acetylene and the second valve is then opened to admit oxygen to the burner tube.

* * *

Stainless Electrode

2,639,362. PRENTISS S. VILES, Baytown, Tex. Assigned by mesne assignments to Standard Oil Development Co., Elizabeth, N. J. Originally filed Oct. 23, 1950. Divided and this application Sept. 10, 1951. Granted May 19, 1953.

This electrode was developed to weld a ferrous alloy containing nickel, chromium and iron. It contains these three elements and has a welding flux coating. The welding flux comprises between 75 and 99.75% by weight of the coating. Between 0.25 and 25% of the coating by weight is sulfur. Weight ratio of the coat to rod is betweeen 1:2 and 1:4.

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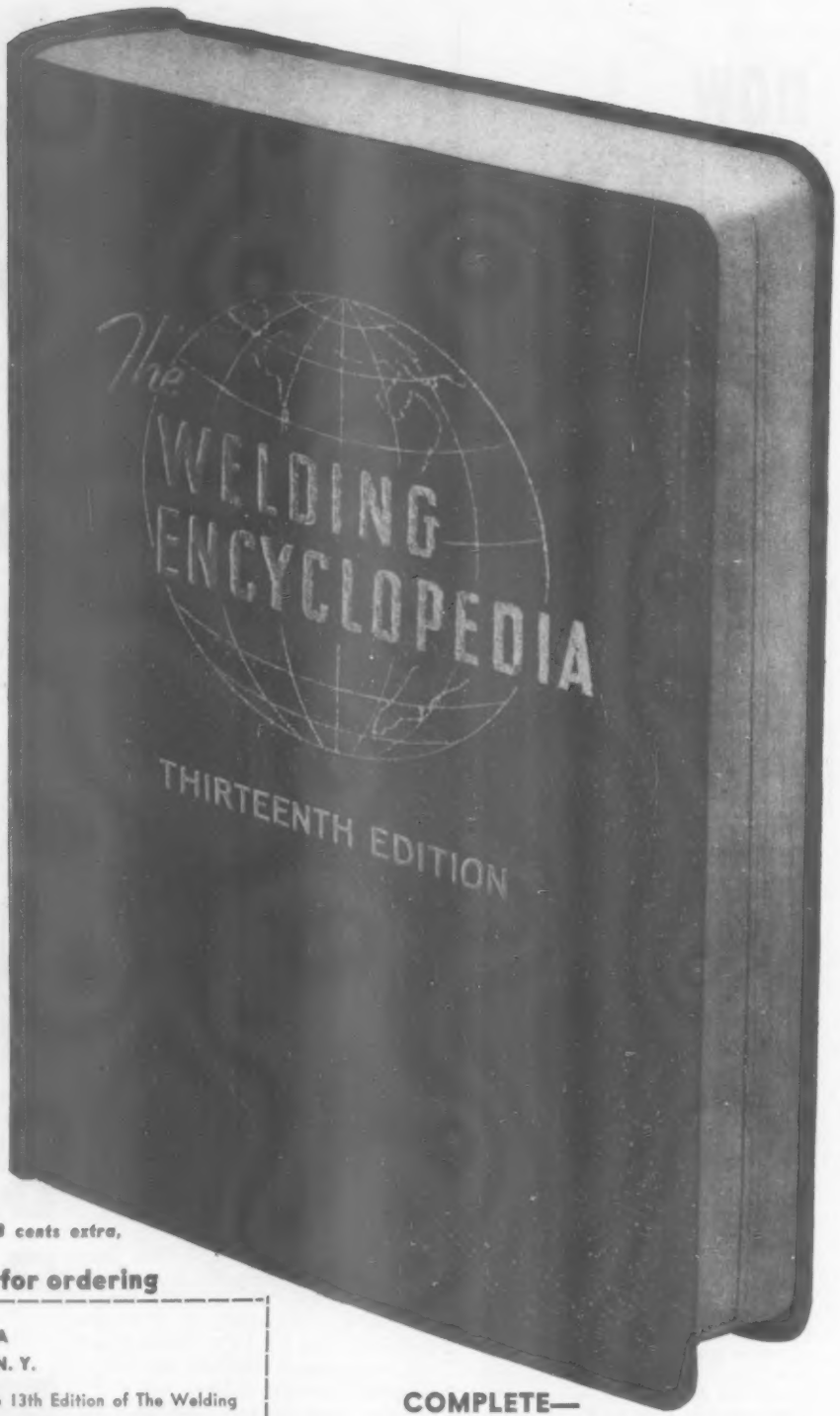

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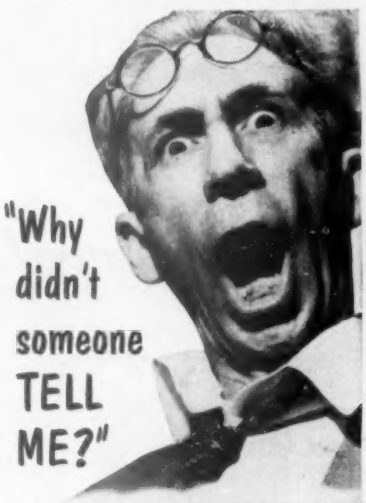

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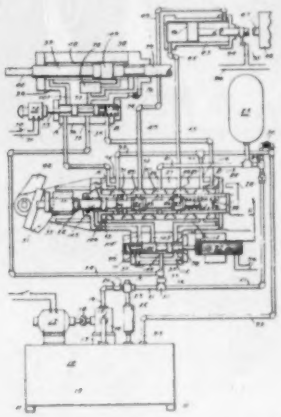
Hydraulic Flash Welder Control

2,640,134. KINGSLEY A. DOUTT, Detroit, Mich. Filed Oct. 12, 1950. Granted May 26, 1953.



This patent refers to hydraulic control apparatus for a flash welder having a normally fixed platen and a movable platen operated by a fluid pressure motor. The apparatus acts to control the movement of the movable platen during a welding cycle. It comprises in combination a source of hydraulic fluid under pressure and a valve for controlling the fluid flow to the motor. The valve has two movable elements. A secondary fluid pressure operated motor is also provided. Variable motion transmitting mechanisms interconnect the secondary fluid pressure operated motor. The valve elements move relatively so that the movement of the platen will follow a predetermined position-speed relationship during the flashing period of the cycle.

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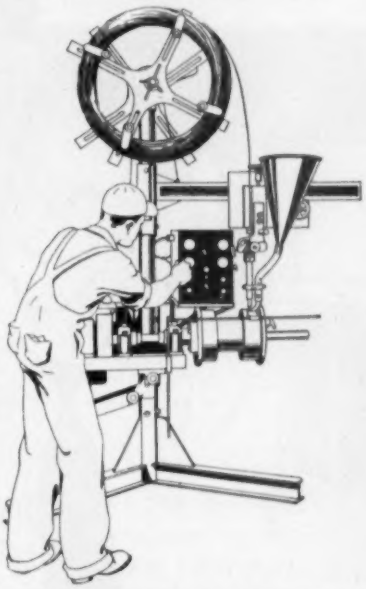

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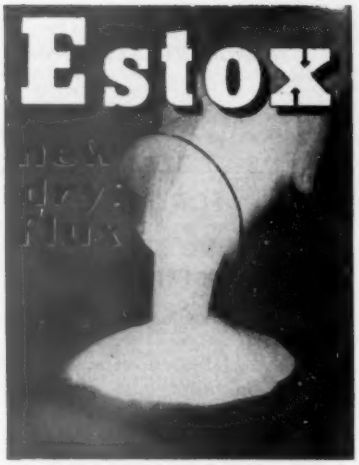

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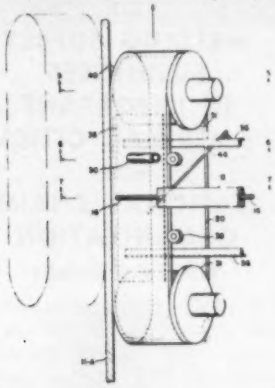
Tank Welding Process

2,638,524. AMEL R. MEYER, Griffith, Ind. Assigned to Graver Tank & Mfg. Co., Inc., East Chicago, Ind. Filed Oct. 24, 1951. Granted May 12, 1953.

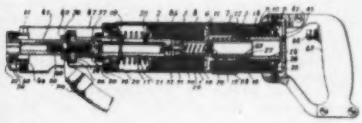


This patent refers to a welding process for use on an upstanding shell. The process comprises the steps of movably holding the ends of a deformable, substantially longitudinally extended strip to the ends of a horizontal area of the shell. The next step is to deform an intermediate part of the so extended strip toward the shell to press the part to the shell regardless of horizontal curvature and irregularities in the shell. A layer of flux is then poured onto the said part containing the shell. The shell is then horizontally traversed with a welding arc submerged under the flux.

* * *

Stud Welding Gun

2,640,133. ARTHUR RATCLIFFE AINSWORTH and JAMES BINNIE MILLER, London, England. Assigned to Cyc-Arc Ltd., London. Filed March 27, 1950. Granted May 26, 1953.



This patent refers to electric arc welding apparatus for welding studs to plates and comprises a body and a stud chuck carrier axially movable in the body. The latter consists of two co-axial relatively movable parts. A coupling member connects the two parts and determines the maximum distance of their possible separation. Yieldable means act to separate the parts to such maximum distance. Clutch means within the body are operable to effect clutching engagement with the inner part of the stud chuck carrier to immobilize the said inner part. Electromagnetic means attract the outer part into contact with the inner part.

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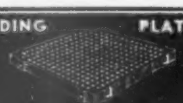

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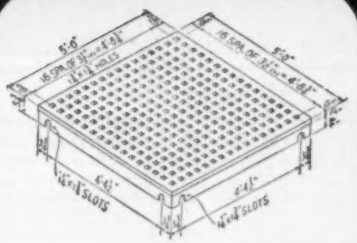

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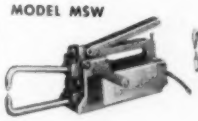

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